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THE FOREMAN AND HIS JOB

The Link Between Management and Production

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(When a Business Is "Sick.")

IT IS rather a common experience for an industrial plant to find it necessary to take account of stock and do some business housecleaning. This condition often appears even in the midst of a period when the market is good, when sales are easy to make, and when money comes in without much effort. It is quite possible for a company to be doing a large business and at the same time making little or no returns on the capital invested in the undertaking. Their equipment may be the finest that money can buy; their product a standard and well-known commodity; their labor well paid; and yet somehow or other things do not go right. There is a large labor turn over; the overhead charges are high; and in general the business looks sick and in need of a doctor. Perhaps after several directors' conferences the business doctor, in the person of the efficiency man, is called in and after analyzing the case he prescribes a remedy which looks as if it might turn the tide. The whole plan of organization requires to be changed, and a new system which seems to guarantee success is set up. While the doctor is around the patient seems to progress wonderfully; money in the shape of profits is at last coming back to the directors for all their efforts, and they are willing to reward this physician with a handsome fee for his services.

The Foreman and the Remedy.

While the physician was at hand everything seemed to go along all right, but the test of the medicine is whether the patient will keep on progressing after the doctor has left; it is here the real problem of the foreman and his training comes into full significance. If the foreman has not been entirely converted to the new organization, it will fail, and it is not an easy matter to discover whether the foreman has been converted or not. As a camouflager of what he is thinking about, he is the supreme artist, and many an efficiency man has been driven to distraction in trying to find out who it is that is "throwing the monkey wrench into the works" and gumming up his otherwise beautiful running machine. The foreman is the man who can effectively bring to success, or just as effectively gum up any organization scheme for production, and whether he shall effectively help or hinder depends on his vision, adaptability, training and resourcefulness.

The Different Phases of the Foreman's Job.

The foreman stands in that rather unique position of being the first man (of an executive nature) next to the actual production job. While he does not actually produce goods himself, he works with materials, tools and machines, and labor, and is paid for getting out production. His great problem is to get these three factors working in thoro harmony for the one end of production. The first two factors of materials, tools and machines, he can juggle, push, drive, and "cuss" into doing things. The other factor, however, is a human element, and if he is going to be successful he has to tackle it with different methods. If he still thinks that his labor is also a commodity and can be driven and "cussed" into doing things, he makes a wrong guess. Outward appearances may lie in this respect also, (labor knows something of the art of camouflage also) and it is very possible for labor to be looking exceedingly busy and doing very little. The kind of service given with one eye on the job and the other on the boss is only a half service and only worth that much. The foreman therefore has three distinct phases to his job: production, supervision and instruction.

The Foreman and Production.

Production relates first to the problem of getting out of the tools and machines the maximum service they are designed to give; second, to making from the raw material the finished goods with as little waste as possible. In answering this problem the foreman has to know how to handle actual concrete production problems. He must understand and believe in the whole plan of organization behind him; he must recognize his part in it; he must see himself very much in the light of an agent who is doing this service as if it were for himself; he must be thoroly familiar with all the routing, scheduling, executing and dispatching plans, the measurement of rewards, the inter-relations of departments, and all the factory standards; he must

have at his command a technical training in mathematics, science, and drawing as it directly applies to his job; he must have enough command of English to be able to give an order in simple, clear language and to write an intelligent report; he must understand what is meant by analysis and have an analytical type of mind to meet his production problems.

The Foreman as a Supervisor.

As a supervisor, his job is that of preventing of waste in all forms; waste in material, in time, machines, and physical strength and nervous energy. He must see that the plans which have been worked out relating to materials, machines, tools, standards, etc., are being carried out. He ought to be the man who knows why certain plans do not work out as he is right up against the actual working conditions. Many a fine paper plan of organization has gone to pieces when it has been applied to the job, and experts often waste valuable time and money trying to find out where the leaks are, when the foreman could easily have given the information desired, if he wanted to. His biggest power, however, as a supervisor lies in dealing with the problem of the human element. Some men get results by the "slave driver" attitude. It is possible to subject some men to this treatment, and workers may be forced to work steadily by the fear of losing their job or the favor of this "czar" of the work shop; however, the service which is given in this spirit is never a lasting one. There are always continually breaks, the labor turn over is sure to be large, walkouts and strikes are frequent, and the management keep wondering why they did not know the actual conditions before matters had assumed the grave aspect of a threatened strike. The man who does know what is happening in the shop is generally the foreman, and he is in a position to settle most of the disturbances that happen if he only has the ability and point of view to tackle these problems in the right way. The good foreman is the fellow who is recognized among his workers as the captain of the team. There is no mistake about him being "boss" because every one recognizes him as the leader, but he is a leader in the real sense and like any good captain is recognized by his team mates as having superior qualities, and therefore, the service which they give him and which he gives them is one of mutual help and cooperation instead of eye service.

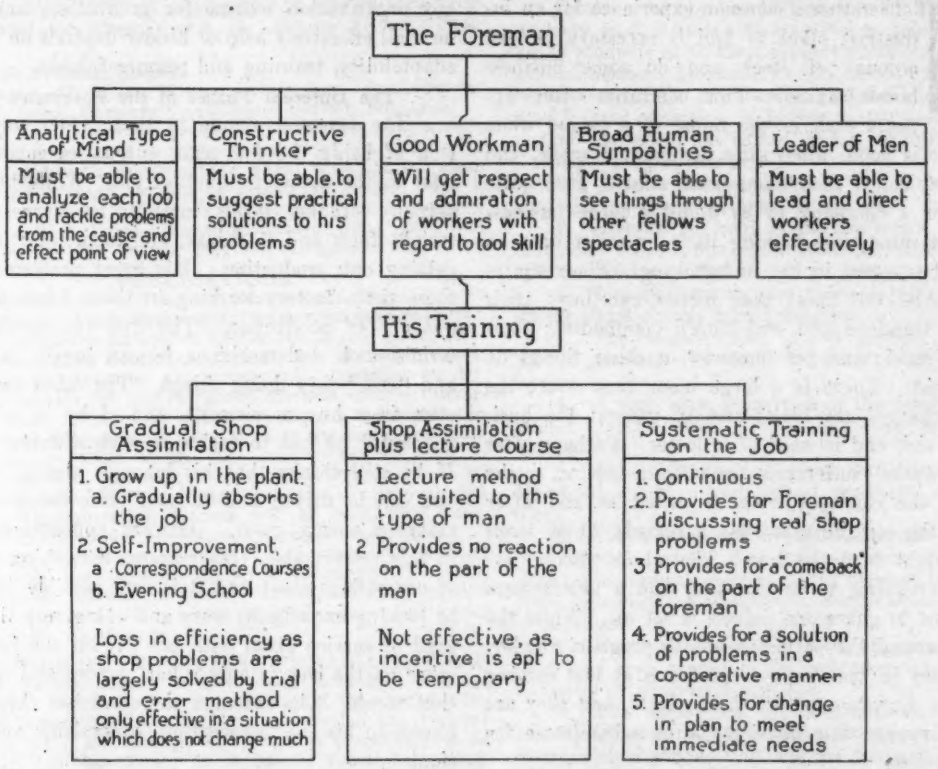

The Foreman
Analytical Type of Mind
Must be able to analyze each job and tackle problems from the cause and effect point of view
Constructive Thinker
Must be able to suggest practical solutions to his problems
Good Workman
Will get respect and admiration of workers with regard to tool skill
Broad Human Sympathies
Must be able to see things through other fellows spectacles
Leader of Men
Must be able to lead and direct workers effectively
His Training
Gradual Shop Assimilation
1. Grow up in the plant.
a. Gradually absorbs the job
2 Self-Improvement.
a Correspondence Courses
b. Evening School
Loss in efficiency as shop problems are largely solved by trial and error method
only effective in a situation which does not change much
Shop Assimilation plus lecture Course
1 Lecture method not suited to this type of man
2 Provides no reaction on the part of the man
Not effective, as incentive is apt to be temporary
Systematic Training on the Job
1. Continuous
2. Provides for Foreman discussing real shop problems
3 Provides for a comeback on the part of the foreman
4. Provides for a solution of problems in a co-operative manner
5. Provides for change in plan to meet immediate needs

CHART I. THE FOREMAN AND HIS TRAINING.

The Foreman as an Instructor.

The third factor in the foreman's job is that of instructor. It is here that his greatest power is felt, and it is here that the average foreman falls down hardest. In giving orders and instructions about work to be done, the average foreman makes his job a difficult one because he fails to recognize the necessity for thinking in terms of the other fellow. If the service which the men under him are giving is that of mere eye service, it is not at all likely that they will be given to asking any kind of questions; and so when a foreman gives instruction to a workman about how to do a certain piece of work the worker is just as likely to say he understands what he is being told, whether he does so

or not. Rather than face the displeasure of appearing ignorant in front of this man he will take a chance and experiment on his own with the job, and it depends on his own training and intelligence whether the job will be successfully completed. If the workman has spoiled the job, it is natural for the foreman to think that the workman is stupied and "no good." The foreman immediately rates him in his own mind accordingly. If, on the other hand, the foreman will see the value of getting a common line of thought between himself and this workman, and also an attitude of mind by which the workman would not be afraid to ask questions, this enormous amount of spoiled work would be very considerably reduced. The one great mental change that has to be made both with regard to the foreman and the workman is on the question of exchange of intelligent questions. There seems to be an unwritten law in the shop, that to ask a question about the job is a man learns that he will not be "fired" just because he truthfully states he does not know how to do a certain piece of work, or does not understand what the foreman has said, he is likely to increase his respect for the foreman and corporation with whom he is working, and this is the beginning of that rare quality of loyalty which we all prize so much.

The Foreman and the New Man.

The foreman is also very closely associated with the problem of the new man. It is in his power to get this man quickly adjusted to his new conditions. The adjustment period is the critical time for the new workman. During this period, whether it lasts a day or two weeks, the company is losing money on the new man. He is like the mouse in the strange garret and has to be made "at home", mentally and physically, before he can really begin to produce what he is worth. The power of either prolonging, or shortening up, this

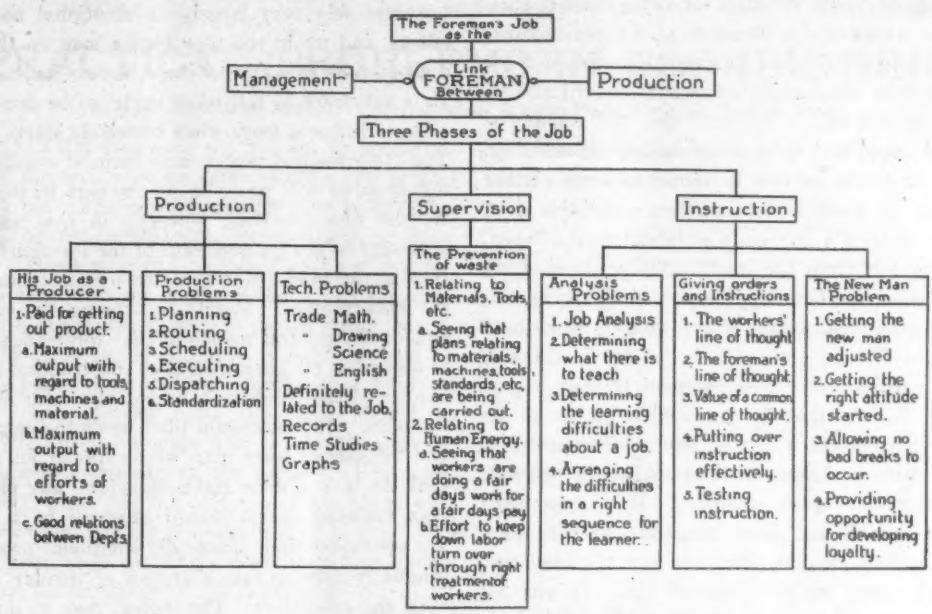

The Foreman's Job as the
Management
Link FOREMAN Between
Production
Three Phases of the Job
Production
Supervision
Instruction
His Job as a Producer
1. Paid for getting out product.
a. Maximum output with regard to tools, machines and material.
b. Maximum output with regard to efforts of workers.
c. Good relations between Depts.
Production Problems
1. Planning
2. Routing
3. Scheduling
4. Executing
5. Dispatching
6. Standardization
Tech. Problems
Trade Math.
" Drawing
Science
" English
Definitely related to the Job.
Records
Time Studies
Graphs
The Prevention of waste
1. Relating to Materials, Tools, etc.
a. Seeing that plans relating to materials, machines, tools, standards, etc. are being carried out.
2. Relating to Human Energy.
a. Seeing that workers are doing a fair days work for a fair days pay.
b. Effort to keep down labor turn over through right treatment of workers.
Analysis Problems
1. Job Analysis
2. Determining what there is to teach
3. Determining the learning difficulties about a job.
4. Arranging the difficulties in a right sequence for the learner.
Giving orders and Instructions
1. The workers' line of thought
2. The foreman's line of thought.
3. Value of a common line of thought.
4. Putting over instruction effectively.
5. Testing instruction.
The New Man Problem
1. Getting the new man adjusted
2. Getting the right attitude started.
3. Allowing no bad breaks to occur.
4. Providing opportunity for developing loyalty.

CHART 2. THE FOREMAN'S WORK.

mark of ignorance and the great game is that of "looking wise" and getting away with it. This has come about from the success of this method. The average workman tries it in every place he goes. He finds out that it pays to try to bluff his way around, and so when he meets the foreman and his job, this process of bluffing is kept up, and by bluffing and looking wise, and learning by the costly mistakes which he has made (and which by the way the manufacturer pays for entirely) the workman has gradually acquired some skill and technical knowledge. This whole terrible system of bluffing has to be broken down if we are to carry out with any degree of success the science of production which we have now developed to a high degree of efficiency. The break down in this system will come thru the education of the worker and a better understanding between the foreman and the workman. If a adjustment period is very much in the hands of the foreman and his fellow workers. He will get from his fellow workers a first-hand impression of how he is to think about the firm. They will tell him whether the corporation is a "bunch of money grabbers" or whether they are fine people and strong for giving the worker a square deal; he will also learn from them whether the foreman is a proverbial grouch or that prince of a good fellow, whether he is captain, or czar and slave driver. He will learn many other things during the first lunch hour that are not written in the printed statement which he may get at the employment office. This first meeting of kindred minds is a very important one, both for the new man and the company and many impressions for good or evil are made in an indelible manner. The foreman has the opportunity to start this fellow right, and he will start right if the foreman has

built up a corps of loyal workers under him. The new man will get the attitude that the foreman is there to help and not to bully him. In his role of instructor, the foreman will often have to think in terms of learning difficulties instead of production difficulties. His problem here will be one of trying to size up what is "gumming up" this workman's thinking when he does not "catch on" to a new piece of work, or an instruction order. His problem is continually one of trying to make better contacts with what the learner or workman already knows so that he may have some basis for adding on this new piece of instruction.

The Foreman in a Modern Industrial Plant.

Perhaps, enough has been said to show how important a place the foreman occupies in our modern industrial plant. He is at present doing a great service. The good foreman is worth his weight in gold, but he is often very much under paid, and often placed in that most undesirable situation of being kicked about between the unreasonable demands of a superintendent and a lazy response from a group of dissatisfied workers. He is often continually between "the devil and the deep sea" in his efforts to serve the two masters of capital and labor, and is forced to isolate himself from both of these forces because he seems to serve neither. He deserves very much better and more reasonable treatment. He deserves a chance to work out in the "open" and free himself from the undesirable position of appearing to serve the boss only, when he is talking with him, and be the true servant of the workers when he is in the shop. We are getting past the day in thinking that the qualifications for a foreman measure up in the size of the fist that he can double up, or in the amount of horsepower which he seems to command in his lungs. More and more shall we realize the necessity of giving this man special training. His job is really one of the hardest and most important of the minor executive positions, and we shall not have the ideal man for this job unless we have trained him. It will pay the management of any plant to train him by giving him all there is to know about the inside information of the plant's production plan, that is, the whole scheme must be explained to him very thoroly so that he can see it as a whole and really have faith in it. Perhaps he ought to have a share in making the plan, or at least be consulted about it in so far as it touches his job. He has much to learn in the matter of what is meant by supervision, and he has still more to learn on this whole new problem of giving instructions and orders in an effective way, and it has got to be proven to him that it pays after all to treat his workers as human beings, possessing these capacities which enable people to think and act with intelligence.

There are two or three methods which may be followed in training this shop foreman. He can be picked up from the floor and, like "Topsy", allowed to "grow up" into his job without any definite help from any one; or the management can hire some "efficiency" specialist to give a series of lectures to their foremen; or they may train the men on the job by systematic training. The first of these methods is, of course, obsolete when we think of modern industry. The second method is costly and for the most part ineffective. When the men are taken from their tasks for an hour or so during each day and simply given lectures on efficiency methods, the results obtained are small because these lecturers rely very largely on emotional and pictorial effects, and while you may feed a man on this diet for a short time this kind of food has no staying qualities. It is very easy to tell what ought to be done, but it is often a different story when somebody starts something. The other method, where some form of systematic training is given will prove to be the best in the long run. As the first essential, however, in this matter, it is necessary to get the good-will of the foremen themselves, that is, the proposition must be sold to them as well as the management. Merely convincing the superintendent, or the general manager, that foremanship training is needed is no guarantee that constructive results will happen if the foremen have not also been converted to the plan. Any successful plan needs the continual help and nursing of some man whose special job it is to see that the task is done right, therefore, any plan of foreman training course should after all be a continuous process rather than spasmodic emotional proddings and gradually develop into a system of regular conferences with the executives. The logical man to do this work would be a person connected with the regular training department of the plant, if he have the necessary point of view, qualifications and respect of the men. If this plan cannot be carried out, it would be well for a plant to make connections with a recognized expert on this work such as may be found with the Federal Board for Vocational Education, and then have this man work out a plan which would be carried on with his help.

TITLE PAGE AND INDEX READY

A Title Page and Index have been prepared for readers of the INDUSTRIAL-ARTS MAGAZINE who desire to bind the 1920 volume. A copy will be sent postpaid upon post-card request to the Subscription Department, Industrial-Arts Magazine, Milwaukee, Wis.

NAPKIN CASE. CHILD'S PICTURE BOOK. CLIPPING CASE.

PRACTICAL PROBLEMS IN BOOKBINDING

S. E. E. Hammond, Assistant Superintendent Art and Hand Work, Springfield, Mass.

IN THE following ten articles in bookbinding each problem develops some new principle. The cover materials may be of plain figured paper, crepe, cretonne, silk, or satin. These may also be substituted for the vellum. The term ironing means rubbing out smoothly being careful the entire surface is pasted down leaving no air bubbles. Special attention should be paid to ironing the edges as this gives a professional finish to the work. In applying paste the paste should be brushed well into the surface and be smooth allowing no small lumps to remain on the surface. Use newspapers freely when pasting and also place them over and in work when putting it under weight to dry. The extra allowance when mitering corners should be a little greater than the thickness of the cardboard.

Handerchief Case.

Material.

2 pc. cardboard 3¾″ x 3¾″.
2 pc. cretonne 4¾″ x 4¾″.
2 pc. lining paper 3¼″ x 3¼″.
1 pc. cretonne 1½″ x 12½″.
1 snap.

Lay one piece cardboard on the wrong side of one piece cretonne 4¾x4¾″ so there is one-half inch border of cretonne on all sides. Draw pencil line on cretonne around cardboard. Remove cardboard. Repeat with other cardboard and cretonne 4¾x4¾″. Apply paste to one face of cardboard brushing the paste in well. Lay pasted side down in drawn square on cretonne. Iron well with thumb. Mitre the four corners. To mitre corners measure back from the corner an equal distance on each side placing dots. Draw diagonal line connecting the two dots. This diagonal should be about the thickness of the cardboard from the corner of the cardboard. See illustration.

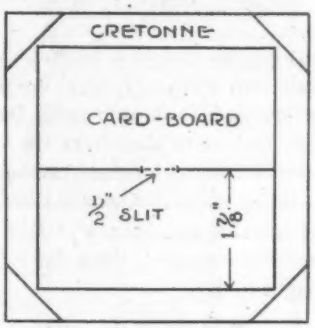
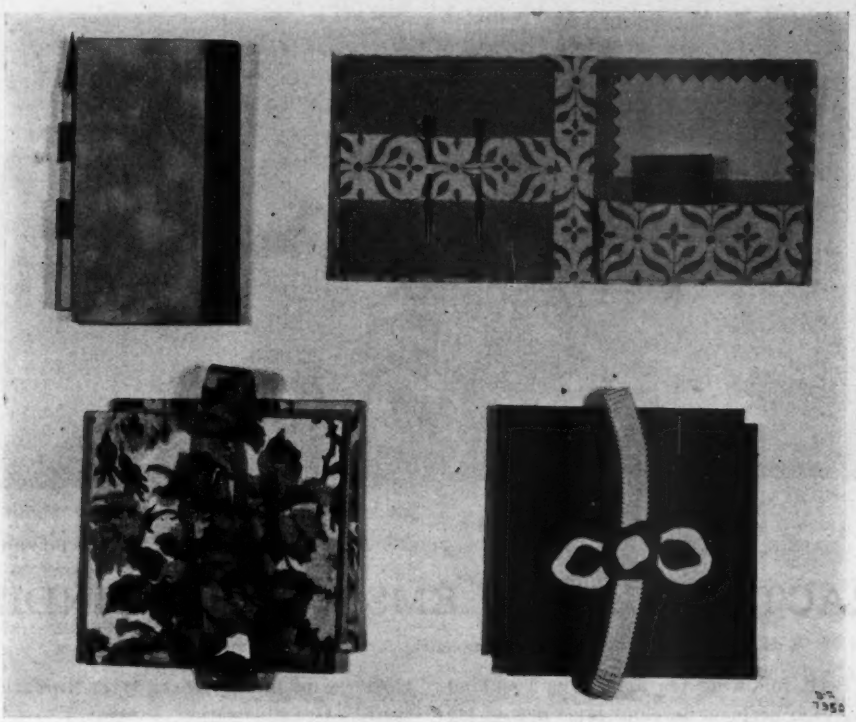


FIG. 1.

Apply paste to one and one-half inch extending cretonne strip. Fold up closely to edge of cardboard. Rub edge down well and paste down strip on cardboard. Repeat for opposite edge. Paste the remaining two edges in like manner. Apply paste to one lining paper and paste on cardboard. Care should be taken to place paper so there is one-quarter inch margin of cretonne on all sides. Place between papers and under weight to dry. On the remaining cardboard square draw a 3¾″ line 1⅞″ from and parallel to one edge. This line passes thru the center of the square. See illustration. Place a dot on this line 1⅞″ from end of line. This marks the center of square. Place on this line two dots each one-eighth inch from center. Using sharp knife blade slit the cardboard between these two dots. See illustration. Paste cardboard to cretonne in same manner as first board. Slit cretonne to correspond with slit in cardboard. Fold over one-half inch each long edge of cretonne 1½x12½″. Paste down the one-half



ABOVE: (LEFT) SHOPPING LIST NOTE BOOK; (RIGHT) SEWING CASE. BELOW: HANDKERCHIEF CASES.

inch folds shaping one end to a point. You now have a strip one-half inch wide and 12½" long. Sew parts of snap about one inch from each end. Insert straight end of one-half inch strip thru from the cretonne side and paste down end about one-half inch on cardboard. Paste on the lining paper. Apply a little glue to the middle of the one-half inch strip and glue to center of cretonne side of other square. Place flat between papers and under weight to dry.

Blank Book Cover.

Material.

1 blank book 4" x 6⅞".
1 pc. tag board 7¼" x 8⅝".
1 pc. cretonne 8¼" x 9½".
2 pc. cretonne 3¾" x 8".
1 pc. lining paper 7" x 8½".

Fold tag board on short diameter. Unfold. Lay tag board 7¼x8⅝" on wrong side of cretonne having one-half inch extension of cretonne on all four sides. Draw pencil line on cretonne around tag board. Paste tag board within these lines. Mitre the corners. Paste the extending cretonne edges down on tag board. Fold on short diameter. Place paper between and put under weight.

Fold up on wrong side of 3¾x8" cretonne one-quarter inch fold on one-eighth inch side. Paste down the fold. Repeat on other piece of same size. Lay lining paper on one of these pieces of cretonne allowing the three other sides to extend one-half inch. Mark on cretonne around these three sides. Mitre the two corners. Apply paste to the long one-half inch extension and paste down on lining paper. Paste the two end one-half inch extensions. Repeat with other cretonne of same size. Fold lining paper on short diameter with the cretonne pockets inside. Unfold. Apply paste to outside surface of lining paper and paste on inside of tag board. Fold, place papers between, and put under weight. Slip the stiff cover of blank book in pockets.

Needle Case.

Material.

2 pc. cardboard 3⅜" x 3⅜".
2 pc. lining paper 3¼" x 3¼".
1 pc. cretonne 4½" x 8¼".
1 pc. cretonne 1⅛" x 3⅜".
1 pc. cretonne 1½" x 4¼".
1 pc. cretonne 3½" x 3¾".
1 pc. white flannel 1⅝" x 2¼".
2 pc. ¼" tape 5½".
Needles of different sizes.

Place cardboards on cretonne 4½x8¼" so there is one-half inch border of cretonne and one-half inch space between cardboards. Fig. 2. Draw lines around each cardboard on cretonne. Mitre four corners. Paste long edges. Paste short edges. Iron well edges and laps.

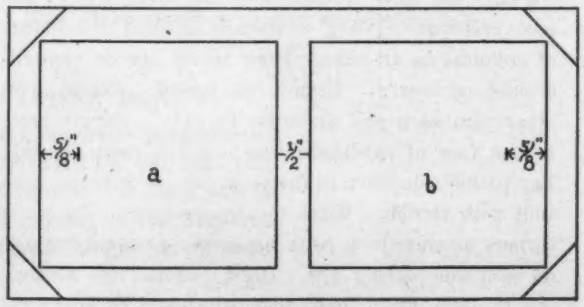
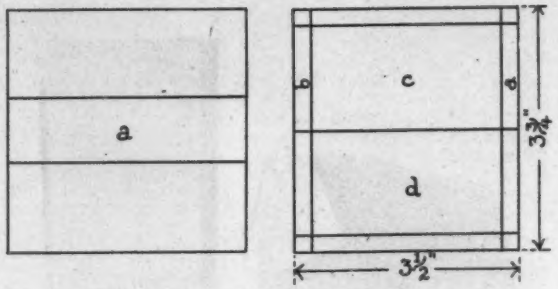


FIG. 2.



FIGS. 3 AND 4.

Paste 1⅛x3⅜" cretonne on one-half inch space between "a" and "b" with one-quarter inch extensions on "a" and "b". Measure in five-eighths inch from the two outside edges and cut one-quarter inch slit thru cardboard and cretonne and equal distance from other two edges. Fig. 2. Slip the tapes thru these slits from the cretonne side. Paste down one-half inch ends of tape on "a" and "b".

Fold one-quarter inch fold on each long edge of cretonne 1½x4½". Paste down folds. Fold one-half inch fold at each end. Place strip on lining paper in position "a". Fig. 3. Paste down the two one-half inch flaps. Paste lining paper "a" Fig. 2.

On wrong side of cretonne 3½x3¾" draw lines

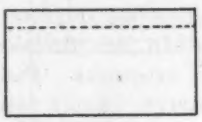


FIG. 5.

one-quarter inch from the four edges. Fig. 4. Draw diameter. Cut out four corner squares. Cut out oblongs "a" and "b" Fig. 4. Fold and paste the two long one-quarter inch oblongs. Fold and paste the two short one-quarter inch oblongs. Apply paste to two oblongs just pasted. Fold "c" on to "d". Iron short ends well. Fold the long folded edge of this pocket back one-half inch. Fig. 5. Paste this one-half inch by three inch oblong on one edge of lining paper. Paste lining paper in position "b" Fig. 2. Notch three sides of flannel piece. Paste the long unnotched edge on lining paper above pocket for needles.

Place different sizes of needles in strip and paper of needles in pocket.

Shopping List Note Book.

Material.

2 pc. cardboard 2½" x 4¼".
2 pc. cover paper 2½" x 5¼".
1 pc. lining paper 2⅜" x 4".
1 pc. satin 1½" x 5¼".
1 pc. satin 1½" x 4".
2 pc. satin 1" x 2".
1 pc. white paper ¼" x 2¼".
1 pencil 4" long, color to harmonize with book.

On cardboard 2½x4¼" rule line one-half inch from and parallel to one 4¼" edge. Repeat on underside of cardboard. Repeat on other cardboard. Place cardboard on cover paper 2½x5¼" with one long edge of cardboard to one long edge of cover paper and three one-half inch extensions of three other sides. Fig. 6. Draw lines on paper around cardboard. Repeat on other cover paper.

On satin 1½x5¼" rule lines one-half inch from and parallel to all four edges. Fig. 7. Apply paste

FIG. 6.

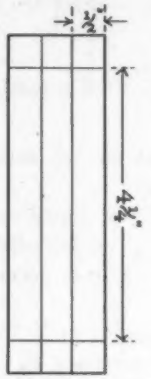


FIG. 7.

to one-half inch strip on cardboard. Paste cardboard to oblong of satin ½x4¼". Fig. 7. Repeat with other board and oblong. Turn up and paste down the two one-half inch extending ends.

Apply paste to two oblongs marked "x" Fig. 8, and extend to one-eighth inch from each edge. Paste satin 1½x4" on these oblongs. Iron well both flat surfaces and edges of cardboards.

Apply paste to back of cardboard. Lay on cover

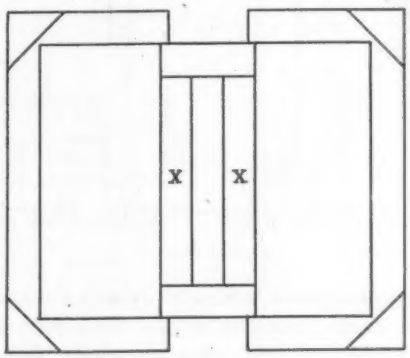


FIG. 8.

paper the three edges to three lines. A little paste on edge of cover paper will insure good pasting on satin. Iron well. Mitre corners. Paste long one-half inch extension on cardboard. Paste short one-half inch extensions. Repeat with other cover paper. Place between papers and under weight to dry.

Fold over two edges of satin 1x2" to make oblong ½x2". Paste. Repeat with other piece. Place satin ½x2" round pencil keeping ends even. Paste ends together. Leave on pencil until dry.

On "a" Fig. 9 measure 1¼" from upper corner on 4¼" edge. Measure one-half inch from this point. In this one-half inch space paste on the satin fasteners.

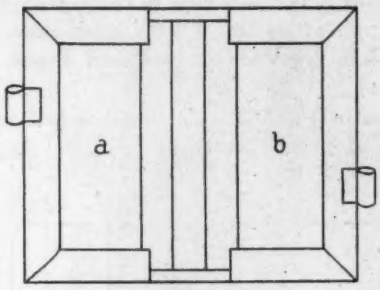


FIG. 9.

Repeat on "b" measuring from the lower right hand corner.

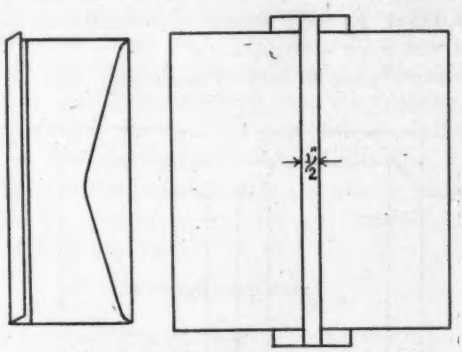
Paste lining paper on "a". Paste white paper 1/4x2 1/4" on top edge of pad. Paste pad on "b". Close book. Slip in pencil. Place under weight to dry.

Clipping Case.

Material.

8 envelopes 3⅞" x 8⅞".
2 pc. cardboard 4⅛" x 9¼".
13 pc. vellum 1¼" x 8⅞".
1 pc. vellum 2½" x 10¼".
2 pc. crepe 3⅞" x 9⅞".
2 pc. lining paper 3¾" x 8⅞".

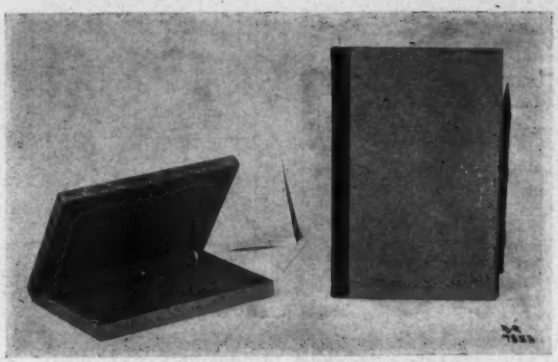
Fold 13 pieces vellum on long diameters with right side in. With vellum still folded paste outside ⅝x8⅞" on closed long edge of envelope placing fold of vellum to edge of envelope. See Fig. 10. Paste another strip



FIGS. 10 AND 11.

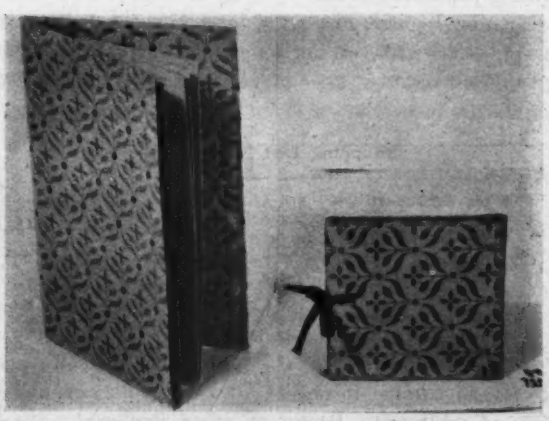
of vellum on opposite side of envelope. Paste a second envelope to the unpasted side of the second piece of vellum. Continue until all envelopes are fastened together like the leaves of a book. When finished there should be two vellum strips outside the envelopes. These are to bind them in the book later.

Place under weight. Place cardboard 4⅛x9¼" on wrong side of crepe 3⅞x9⅞" having one-half inch extension of crepe on three sides. Draw line on crepe around three sides of cardboard. Repeat on other crepe 3⅞x9⅞". Draw one 9¼" line on each 4⅛x9¼" cardboard one inch in and parallel with 9¼" side. Place cardboard on wrong side of 2½x10¼" vellum edge of vellum to line on cardboard. Draw 10¼" line on vellum at edge of cardboard. Repeat on opposite side. This leaves one-half inch between two lines for hinge. See Fig. 11. Apply paste to strip 1x9¼" of cardboard.



ONE-PIECE BOX. CORRESPONDENCE CASE.

Place on vellum with edge of vellum to line on cardboard with one-half inch extension of vellum at each end. See Fig. 11. Repeat with other cardboard. Apply paste to one-half inch extension of vellum. Paste down on cardboard. Iron well at top and inner edges of cardboards. Repeat with other extension. Apply paste to cardboard extending paste one-quarter inch over edge of vellum. A paper laid over vellum leaving one-quarter inch edge exposed will bring good results. Lay cardboard to correspond with three lines drawn on crepe. Iron well. A little paste on edge of crepe that laps on vellum makes a good pasted edge. Mitre two corners. For directions see Handkerchief Case. Paste down the long one-half inch extension. Paste the two one-half inch end extensions. Paste other piece of crepe in same manner. Apply paste to one outside strip of vellum on envelopes. Lay fold of vellum to correspond with edge of cardboard at hinge having one-quarter inch cardboard extension at each end. Iron well. Apply paste to other outside vellum strip. Bring other cardboard over with all edges in line with edges of first cardboard. Iron well and put under weight to dry. Apply paste to lining papers. Place inside of covers. Care should be taken in placing, to have edges straight with edges of cover, then iron thoroly. Place papers between covers and outside envelopes. Put under weight to dry.



DETACHABLE BLANK BOOK AND COVER. SEWING CASE (CLOSED).

Tea Napkin or Doily Holder.

Material.

(a) 2 pc. cardboard 9⅜″ x 11″—front and back.
(b) 1 pc. cardboard 3″ x 11″—lap.
(c) 2 pc. cardboard 3″ x 9⅜″—laps.
1 pc. crepe 20″ x 30½″.
2 pc. ¼″ or ½″ tape or ribbon 6″.
5 pc. lining paper cut smaller than cardboards so there are one-quarter inch margins on all sides.

Cut corners of "b" and "c" cardboards as shown in Fig. 12. On one 11″ side of cardboard 9⅜x11″ draw 11″ line one inch from and parallel to edge. In the middle of this line cut a slit the width of the tape or ribbon. Lay cardboards on wrong side of crepe. See Fig. 13. Draw round each cardboard on crepe. Remove cardboards. Draw lines one-half inch from the outside lines. See Fig. 13. Cut out crepe cover on these lines. From the remaining crepe cut one strip 2x11″ and two strips 2x9⅜″. See Fig. 13. Apply paste to one cardboard 9⅜x11″ and place in position for back cardboard. Iron well. Paste front cardboard in same manner. Notice the position of the two slits in Fig. 13. Mitre the two corners of crepe. Slash crepe at four corners of cardboard No. 1. See Fig. 13. Paste long one-half inch crepe margin on front cardboard. Paste the two end margins. Paste the long crepe margin of the long lap. Paste ends—paste diagonals. In like manner paste the margins of the two smaller laps. Paste the two strips of crepe 2x11″, one joining the front and back cardboards, the other joining the back and long lap cardboards. These should extend on each board one-half inch. Iron down well at the edges of each cardboard one-half inch, using thumb nail or ruler edge. Paste the two strips of crepe 2x9⅜″ in like manner on end laps and back cardboards. Paste lining papers on laps. Slit the crepe at slits in front and back cardboard. Insert one six-inch length of tape or ribbon in each slit and paste one-half inch ends on inside of cardboards. Paste lining papers on front and back cardboards. Place holder flat between papers and under weight to dry.

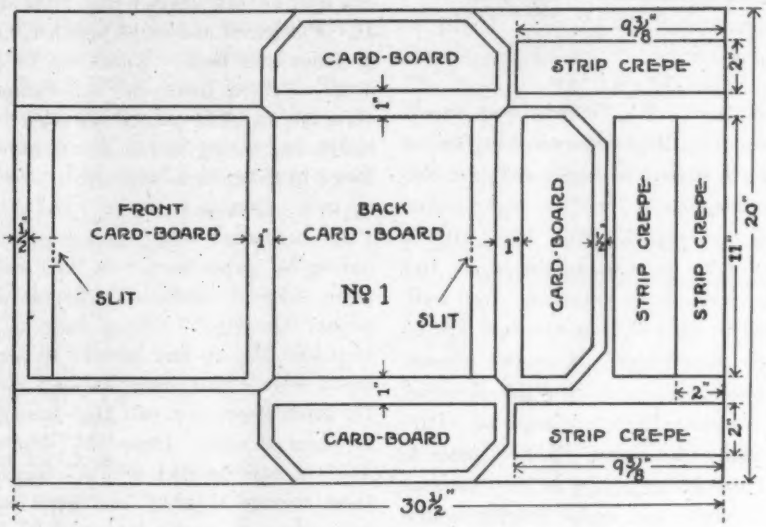


FIG. 13.

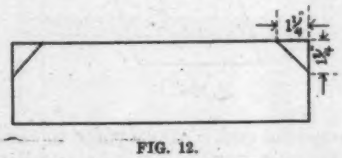


FIG. 12.

Open Back Book or Child's Picture Book.

Material.

2 pc. cardboard 9½″ x 12½″.
2 pc. cardboard 1″ x 9½″.
2 pc. vellum 3½″ x 10½″.
2 pc. cretonne 10″ x 14″.
4 pc. lining paper 9⅞″ x 11⅞″.
2 pc. thin muslin 1½″ x 10½″.
Paper strips 2″ x 11⅞″ }
Paper leaves 9″ x 11⅞″ }
If paper leaves are used.
or
cloth leaves 10¼″ x 11⅞″—If cloth leaves are used.
6 eyelets.
1 pc. ¼″ tape—18″.

Place cardboard 9½x12½″ on wrong side of cretonne 10x14″ having three-quarter inch margin of cretonne on three sides of cardboard. Draw line on cretonne around three sides of cardboard. Repeat on second piece of cretonne.

On thin muslin strip 1½x10½″ paste one cardboard 1x9½″ and one cardboard 9½x12½″ leaving one-eighth inch between boards and one-half inch of muslin at each end. See Fig. 14. Paste down one-half inch strips on cardboards. Draw 3½″ line one-half inch in and parallel to 3½″ edge of vellum 3½x10½″. See Fig. 15. Repeat on opposite end. Repeat on second piece of vellum. Fold both pieces of vellum on long diameters. Unfold. Apply paste to opposite side of cardboard from muslin covering same sized space as muslin. Lay cardboards of Fig. 14 on vellum with

9½" edge of 1x9½" cardboard to fold of vellum and between pencil lines. Iron well all edges of cardboard. Cut out two oblongs marked "x" (Fig. 15). Apply paste to two small extending oblongs and paste down. Iron well. Apply paste to long oblong. Paste down.

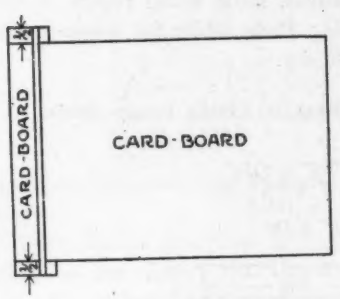


FIG. 14. FIG. 15.

Iron all edges and surfaces well. Place between papers and under weight to dry. Repeat on second piece of vellum. Apply paste to surface of large cardboard and extend on to vellum one-quarter inch. A paper placed over vellum exposing one-quarter inch edge will be found helpful in applying paste to vellum edge. Lay cardboard in marked position on cretonne. Iron well. A little paste applied to edge of cretonne that laps on vellum insures a well pasted edge. Mitre two corners. For directions of mitered corners see "Handkerchief Case." Paste long margin. Paste end margins. Care should be taken to make nice corners. Apply paste to one lining paper. Paste being careful to keep margins even. Place between papers and under weights to dry. Repeat for second cretonne and lining paper. If paper leaves are used paste as many leaves as desired on stubs 1½x12", using one-half inch laps. Also paste two end papers on stubs 1½x12" using one-half inch laps. On front and back vellum strips mark a point three inches from end and one-half inch in from edge. Repeat at opposite end. Mark a point one-half way between these two points and one-half inch in from edge. Punch holes and set eyelets at these six points. Punch the stubs to correspond with the eyelet holes. Place stubs pasted to lining papers at front and back of assembled

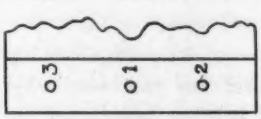


FIG. 16.

leaves. Knock up leaves to be true and even. Place front and back boards and fasten all together with one-quarter inch tape. To thread in tape see Fig. 16. Bring tape from the back up thru 1—down thru 2—up thru 1—down thru 3 and tie in hard knot at 1. Cut ends short.

Post Card or Stamp Book.

Material.

2 pc. vellum 1⅛" x 5⅛".
1 pc. vellum 3½" x 7".
2 pc. cardboard 5½" x 8⅜".
1 pc. thin muslin 3½" x 5½".
22 pc. gray paper 5⅛" x 8¼"—leaves.
10 pc. gray paper 1½" x 5⅛"—stubs.
2 pc. colored paper 6¾" x 7¾".
4 pc. colored paper 5⅛" x 8⅛"—lining and end papers.

Fold stubs on long diameter. Place 2 leaves in each stub. Fold 2 pieces of vellum 1½x5⅛" on long diameters folding right side in. Keep folded and paste on long edge of two remaining single leaves placing fold to edge of leaf. Place 5 dots one-quarter inch in from fold on vellum that is pasted on single leaf, one dot in middle and two dots on each side 1⅛" apart. The end dots are one-quarter inch from each end. See Fig. 17. Put leaves and stubs together, having single leaves at front and back. Knock up to have all true and even. With a small awl and hammer punch 5 holes thru the leaves at points indicated by the dots. With needle and strong thread sew as indicated by numbers: Down in 1—up in 2—down in 1—up in 3—down in 4—up in 5—down in 4—up in 3 and tie in hard knot at 1. Place cardboard 5½x8⅜" on colored paper 6¾x7¾" having ⅝" paper border on three sides. Trace around three sides of cardboard. Repeat on other 6¾x7¾" paper. On 3½x7" vellum draw on wrong side seven-inch line 1½" in and parallel to edge. Repeat on opposite edge. This leaves one-half inch strip in middle. On same piece draw two 3½" lines ¾" in and parallel to edges of ends. Draw 5½" line on each cardboard 1½" in and parallel to 5½" edges. Apply paste to these oblongs 1½x5½" and paste muslin strip placing long edges of muslin to pencil lines. This will leave a space of one-half inch between cardboards for hinge. Paste vellum strip 3½x7" placing long edges to pencil lines and allowing ends to extend ¾". Iron well. Apply paste to ¾" extension, fold close to edge and iron down well. Smooth edges of board with thumb or ruler.

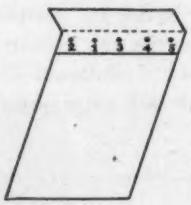
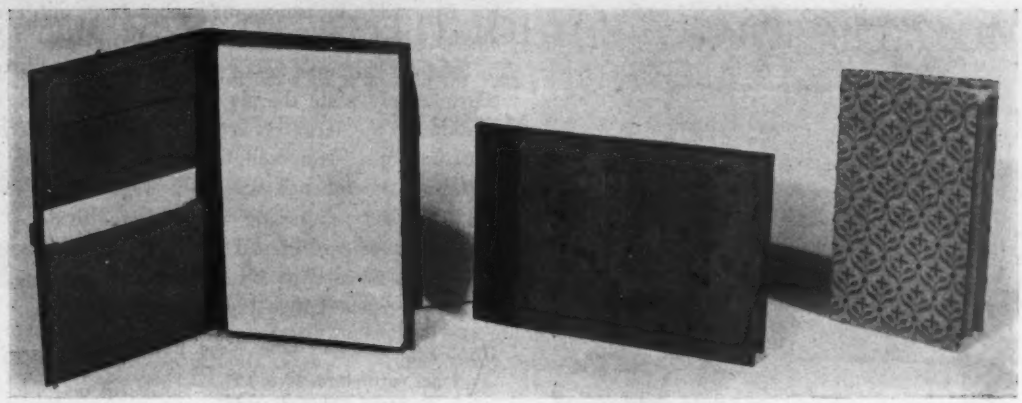


FIG. 17.

Repeat on opposite end. Apply paste to cardboard and on one-quarter inch vellum strip. Lay in place on paper and iron well. Mitre two corners. Apply paste to long border of paper, fold close to edge of cardboard and paste down. Paste opposite edge in same manner. Paste end. In same order paste other paper on other cardboard. Place flat under weight. Apply paste to outside strip of vellum attached to leaves and paste on cardboard, placing fold of vellum to edge of cardboard



CORRESPONDENCE CASE (OPEN). POST CARD OR STAMP BOOK. BLANK BOOK CASE (CLOSED).

at hinge. Be careful that the board extends equally at each end. In same manner paste other vellum to other cardboard. Paste in two lining papers. Draw 5⅛″ line on end papers ¾″ from edge. Apply paste to this ¾″ strip and paste to vellum on the two single leaves, front and back. Place book between papers and under weight to dry.

Writing Case.

Material.

2 pc. cardboard 5½″ x 8½″.
2 pc. cover paper 5″ x 9½″.
2 pc. lining paper 5¼″ x 8¼″.
1 pc. lining paper 6¼″ x 7¼″.
1 pc. lining paper 5¼″ x 8¼″.
1 pc. lining paper 2½″ x 6¼″.
2 pc. narrow tape 6¼″ long.
1 pc. narrow tape 8¼″ long.
1 pc. thin muslin 2¼″ x 8½″.
3 pc. vellum 1″ x 2″.
1 pc. vellum 2¼″ x 9½″.
1 pc. vellum 2¼″ x 8¼″.
1 long pencil.

Rule line one-quarter inch from each long edge of the three vellum strips 1x2″. Fold on these lines. Paste down the folds. Place these strips, now ½x2″, around pencil keeping the one-half inch ends even. See that they fit close to the pencil and then paste extending ends. Leave on pencil to dry. Draw line ¾″ from long edge of 5½x8½″ cardboard. Repeat on other cardboard. Draw two lines each ¾″ from long edges.

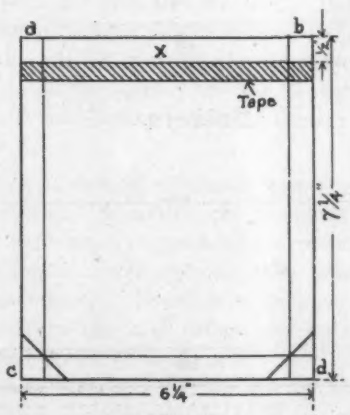


FIG. 18.

of muslin 2¼x8½″. Paste cardboards on muslin. Boards are ¾″ apart. This forms the hinge. Draw line one-half inch from 2¼″ edge of vellum 2¼x9½″. Repeat on opposite end. Paste vellum to hinge of boards being careful to have the one-half inch extension at each end. Iron down well. Paste down the

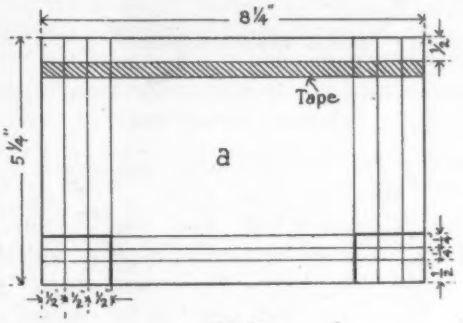


FIG. 19.

one-half inch extensions. Iron edges well. Paste vellum 2½x8¼″ on inside of hinge. Apply paste to outside surface of one board and over one-quarter inch of the vellum. Place on cover paper, edges to drawn lines. Iron down well. Mitre two corners. Apply paste to long extended edge of paper. Paste down. Repeat for end extensions. Paste other cover paper in like manner. Lay between papers and place under weight.

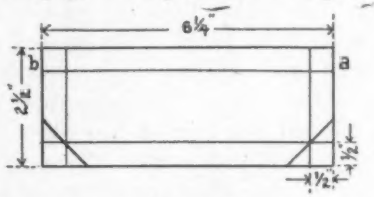
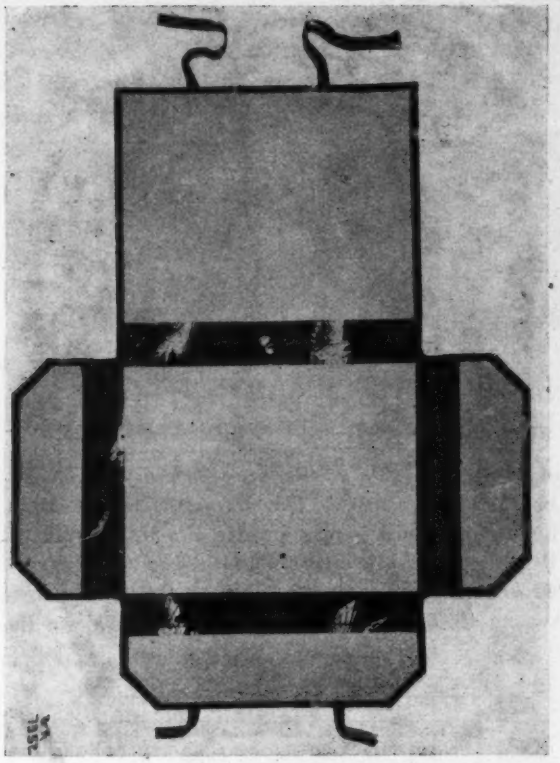


FIG. 20.

Writing Pad Pocket.

On lining paper 6¼x7¼″ draw line one-half inch from 6¼″ edge. Repeat on opposite edge. Draw line one-half inch from 7¼″ edge. Repeat on opposite edge. Place ruler on line and turn up one-half inch strip being careful to turn on line. Repeat for three remaining lines.



INSIDE OF NAPKIN CASE.

See Fig. 18. Cut out one-half inch squares at "a" and "b". Mitre two lower corners at "c" and "d". Paste one 6¼" tape at fold. Paste down one-half inch strip at "x". Lay one lining paper 5¼x8¼" with three edges to the three folds. Paste lower one-half inch strip on lining paper, then paste the two one-half inch side strips.

Envelope Pocket. Draw lines as shown in Fig. 19. Fold on all lines, using ruler edge. Cut out corners "x" and "x", 1x1½". Paste 8¼" tape at upper fold. Paste one-half inch strip down on tape. Fold one-quarter inch fold up on "a". This leaves one ¼" and one ½" fold flat. Fold one-half inch fold at side over on "a". This leaves two one-half inch folds flat. Repeat on opposite side. Place lining paper 5¼x8½" with three edges to the three folds. Paste the one-half inch bottom strip on the lining paper. Paste one-half inch side strip on lining paper. Repeat at opposite side.

Stamp or Card Pocket. On lining paper 2½x6¼" draw lines one-half inch from all four edges. See Fig 20. Cut out one-half inch squares "a" and "b". Mitre the two lower corners. Place opposite end of lining paper from the envelope pocket with three edges to the three folds. Paste the lower one-half inch lap, then the ends. Place under weight. To Place the Pencil Loops. Measure on the inside of one cover two inches from the corner at each end on the 8½" edge. Measure one-half inch farther from these points. Paste two of the pencil loops in these two one-half inch spaces, placing the loop close to the edge. On the inside of the other cover on the 8¼" edge measure four inches from one end and one-half inch from this measure. Paste the third loop in this one-half inch space placing the loop close to the edge. Apply paste thoroly to the back of lining paper containing the large pocket and paste on back having the two loops. Iron well. Paste the remaining lining paper on the other back. Iron well. Keep flat and place between papers and under weight to dry. When dry slip pasteboard of pad in large pocket, fill envelope and stamp or card pockets. Close the case and fasten by slipping pencil thru the three loops.

One Piece Box.

Material.

1 pc. cardboard 9" x 12".
1 pc. cover paper 9" x 12".
1 pc. lining paper 9" x 12".
4 pc. thin muslin ½" x 1½".
2 pc. thin muslin ½" x 6¾".

Lay out cardboard and lining paper plan as shown in Fig. 21 indicated by straight lines (dotted lines show cover paper). Note all dimensions for top are one-eighth inch larger than for bottom. Cut on the heavy outside lines. Paste the unruled side of cardboard to lining paper. Dry under weight. Score pasteboard on uncovered side as indicated by light lines. Turn up sides of box. Fortify four corners with ½x1½" muslin strips. Fortify two back edges with ½x6¾" muslin strips. Allow to dry. Apply paste to bottom, back, and top of box. Lay on cover paper. Iron until smooth. Close box to dry. Cut and fit sides as shown in Fig. 21. Turn over and trim edges. Paste and fit in place in following order—lower front, lower sides, upper front, upper sides. Close box and dry under light weight.

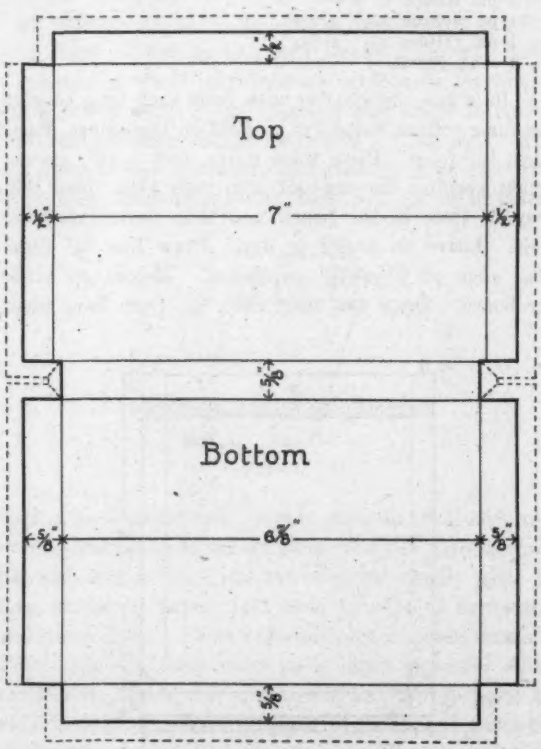


FIG. 21.

A COURSE IN AUTOMOBILE CONSTRUCTION, OPERATION AND REPAIR

Harry W. Anderson, Director Automobile Department, U. S. Army Vocational School, Fort Sill, Okla.

(*Continued*)

THE room allotted to automobile instruction should include a general space for working on cars, a room for lectures and demonstrations and a place for a toolroom at least ten feet square. The garage should have a large entrance door for cars, located in such a way that cars can be driven in directly from the street. An oversight in this direction occurred in two new buildings in an eastern city where one door was three and a half feet above the ground and the other shop had to be entered on a down grade thru an entrance which was so low that the top had to be let down and the windshield taken off. Which reminds you of the old saying that there are two kinds of architecture, "Doric" and "Back Door-ic." In these shops minor repairs had to be done outside rather than go to the trouble entailed in bringing a car in. Mind that these conditions existed in million dollar school buildings where the architect received a fat slice for designing the same. The shop room should be well lighted with plenty of places along the wall in which to enter the socket for an extension cord. A convenient place for washing up after the shop period should also be offered.

The lecture room should afford plenty of blackboard space, a bench with a vise and some tools, a rack for charts, and a table for parts. Needless to say it should adjoin or at least be quite close to the shop. The toolroom can be arranged by partitioning or screening off a corner of the shop. Owing to the ease with which small wrenches and pliers can be picked up and carried out of the shop, some means of keeping a check on tools loaned out from the toolroom should be devised. The conventional checking system using brass checks should prove satisfactory. One good reliable boy can be delegated to take charge of the toolroom. A bench can be provided in the toolroom so that magneto and carburetor repairs can be done by one in charge. There should be a place for each tool and at the end of the period the one in charge should be able to tell at a glance that all tools are in place. In this way a check can be kept on all the tools. Needless to say the instructor should not dismiss class until every tool is accounted for.

The storing of parts of cars while work is going on is another problem. A satisfactory means of taking care of these parts *must be* provided otherwise the instructor is going to worry and lose sleep when some parts turn up missing. Boxes, bins or some similar containers must be provided before any work is attempted. Boxes should be uniform in size so that they can be stacked neatly along-side the car at the end of the period. Such boxes should be furnished the boys before any tearing down of cars is attempted. This is absolutely imperative. It does not take a group of boys long to tear a car down and along with disassembling a car they should be taught to put parts away in the boxes in an orderly manner. If this is not followed it will not be long before the parts for several cars are strewn around the shop, all mixed together, entailing much time and "grief" on the part of the instructor in sorting out.

The question of cars to repair must necessarily be considered. Some of the boys in the class will doubtless have cars which need repairs and replacements. It is not advisable to take in cars promiscuously or in any way to compete with the garages. As a general rule it is best to take in cars which are in bad shape, which afford plenty of work to renew them and which otherwise would not be worth spending $300 or $400 for a complete overhaul. A car in bad shape will doubtless need to be stripped to the bare frame and rebuilt carefully, thus giving the boys a variety of repairing experience. As these cars are obtained for the boys to work on and can be considered as free equipment, it can hardly be argued that any charge should be made the owner of the car, except perhaps for parts. Most of the commercial automobile schools charge but that is how they derive part of their revenue. They are "in the game" for profit and charging for cars is perfectly legitimate business with them. The vocational school automobile shop is maintained by public funds to give a course as a part of the schoolwork, and as such should not compete with the garages and service stations.

The work of rebuilding cars should be handled by organizing the class into foremen and gangs, one gang to a car. The foremen can be chosen from the older and more experienced boys who can prove their initiative and capacity for leadership. Such workers rise to the surface in a short time and it will not be difficult for the instructor to choose capable foremen. The instructor can then explain the method of procedure to each foreman and make him responsible for the job, for the tools used on the job and for keeping a certain area of the shop clean. By dividing the responsibility for the entire shop the instructor is relieved of the burden somewhat and has more time to supervise and inspect. The boys should be taught to report work done so that it can be inspected immediately and new work started. The instructor should be very diligent in watching the work closely to see that everything is tight, cotter pins and lockwashers in every place needed, oil on bearings when put together, etc. An automobile is a dangerous proposition to let boys work

on unless the work is closely watched at all times. Consider what would happen if a cotter pin were left off from a connecting-rod bearing cap bolt, or the steering gear connections.

Careful inspection at each step will make good thoro work possible. It is not within the province of this article to prepare a list of tools, equipment and supplies which will serve for all schools. There is no limit to the amount of money which could be spent on tools which would, at some time or other, be used in an automobile shop. At the same time limited funds should not deter any school from making a start. A surprising variety of work can be done with a few end wrenches and socket wrenches, a valve lifter, some bearing scrapers, and a few other items. Some of the needed articles can be improvised, such as benches, engine stands, auto creepers, boxes for parts, stands for washing parts, extension lamps, auto hoist, (chain hoist suspended from ceiling or tripod of 2x4's, or of 2½ inch pipe), etc. However it is advisable to fit the shop with a goodly amount of equipment because of the large number of special tools required to expedite the work and to show the students the latest and best service equipment. For this reason the appended list of tools gives a number of makes of special tools, the idea being to get several different varieties of each kind of tool, such as, valve lifters, valve grinding tools, bearing scrapers, etc.

The need for plenty of automobile shop equipment does not have to be argued. However there will be school systems which will be niggardly in providing the automobile shop with tools enough to do work of any magnitude. I have in mind a school system which provided all kinds of wood working equipment for the wood shop where they rarely used the machinery and no project was ever made in the wood shop which involved more than a dollar's worth of material. The automobile shop was allotted $400 for the year, but by the end of the school year only a little over half of that amount had been spent. In this amount was included an old car and a few tools to supplement some end wrenches and other wornout tools which the school system already had on hand. In addition to this the instructor had to fight for every item he did get. If he needed any supplies from time to time, such as, cotter pins, screws and nuts, and hacksaw blades, which are urgently needed right along in a shop, it was necessary to wait several weeks for the purchasing agent to get them. The instructor should be given enough equipment to do a creditable job and should be able to obtain immediately any supplies necessary when it is found that he needs them. Better still, he should be given a revolving fund for parts and supplies. Therefore it is urged that the shop be well equipped in the first place, with provision for plenty of supplies and equipment as needed so the work can start off with a bang.

SUGGESTED LIST OF ESSENTIAL TOOLS.

Benches:
Heavy stationary type.
Portable (wheels on one end) Dyke, p. 605.
Table for cleaning parts. Dyke, pp. 603, 602, 741.
Axle stands, p. 605.

Vises:
4" machinists' vises. Hardened steel jaws.
1 Peoria piston vise.

Engine Stands:
Built in shop.
Boxes for storing parts of cars being repaired.

Jacks:
Twin jacks—Weaver.
Jacks, 2-ton—Badger.

Hoist:
Auto hoist or chain hoist.

Portable Boxes for Tools and Parts:
(On casters), Dyke.

Auto Creepers:
(Make.)

Hammers:
Ball peen, cross peen, sledge, riveting, claw, brass and fibre hammers.

Wrenches:
Dropforged end wrenches, S-wrenches, monkey wrenches, adjustable wrench, socket sets, Billmont master-wrench set, Crescent wrenches, pipe wrench.

Cold Chisels:
1", ¾", ½", ¼", Diamond point ⅜".
Cape chisels, ¼", ½".
Round nose, ¼".

Punches:
Drift ⅛", ¼", center punches.

Pliers:
6" and 8" combination.
6" and 8" cutting off.

Files:
Flat, half-round, taper, round, square, platinum point.

Rasps:

File Cards:

Taps and Dies:
Set of U. S. Standard, and S. A. E. taps and dies ¼" to ¾" incl.
Little giant, adjustable tap and tool holder. Starett and Goodell.
1 set Ezy-out screw extractors.

Hack Saws:
Adjustable frame, blades.

Reamers:
1 set straight reamers.
1 set taper.

Valve Lifters:
T & L, chain type, Tu-ford, Trex compressed air valve lifters.

Valve Grinding Tools:
Walden brace type, Just simplicity, Sioux, etc.

Valve Refacing Outfit:
Non-chattering and three cornered.

Bearing Scrapers:
Vichek brand.

Miscellaneous:
2 Pike oil stones, fine and coarse.
1 Atlas abrasive tool, (for dressing crankshafts.)
1 Piston ring compressor.
1 Universal connecting rod alignment jig.
1 Sonoscope.
1 Front wheel alignment tester. Dyke, pp. 683, 737.

Gauges:
1 Thickness gauge, Starrett or B & S.
1 Screw pitch gauge, Starrett or B & S.
1 Wire gauge, Starrett or B & S.
1 Drill gauge, Starrett or B & S.

Calipers:
10" inside and outside lock joint.
6" outside fay patent.
6" inside fay patent.

Micrometers:
1 No. 120, A 2" to 8" inside with case, Starrett.
1 No. 203, 1" outside, Starrett.
1 No. 217, 2" outside, Starrett.
1 No. 128, 2" to 6" outside, Starrett.

Scales:
12 ea. 6", No. 300, Starrett.
2 ea. 12", No. 300, Starrett.

Air Compressor:
Curtis, Usaco, Union, Oro.

Tire Gauges:
Schaefer.
Engine Cleaves:
Romort engine cleaner.
Cylinder Grinder:
Heald.
Emery Wheel Stand:
Drill Press:
Breast drill.
Electric drill, Black and Decker, ½".
Twist drills, straight shank, Cleveland.
Miscellaneous:
1 Crane 3-arm wheel and gear puller No. 3.
1 Portable forge and set of blacksmiths' tools.
1 Wrecking bar.
Hand screws and clamps.
1 Set augur bits—Russell Jennings.
1 Set wood chisels—Buck Bros. Socket firmer, beveled.
1 Jack plane.
1 Crosscut saw, 24".
1 Rip saw, 24".
1 Turning saw-blades.
1 Draw knife.
Blow torches.
Soldering irons.
Babbitt ladles, 3½" and 5".
1 Welding outfit, No. 5, Imperial Duplex welding and cutting outfit.
1 Carbon burning outfit.
1 Starrett gas heater. Dyke, p. 696.
1 Grease gun. Ford feed, Weaver or Boe.
1 Small hand grease gun.
Spring spreaders. Knowlson, No. 1 .
G. I. cans for oily waste.
Scrap boxes.
Trouble or extension lights with cord.
Tinners' snips.
Grease pans, 5" high, 20" wide, 40" long, made from galvanized iron.
Radiator test tank.
Fire test tank.
Funnels.
Oilers, long and short spout.
Oil filter.
Radiator filler.
Buckets.
Brooms.
Special Ford Tools:
1 Burning in stand.
1 Ford main bearing rebabbitting jig.
1 Ford connecting rod.
1 Lewis combination crankshaft and connecting rod reamer.
1 Set Alvord special Ford reamers.
1 Set Walden special Ford wrenches.
1 Rear wheel puller.
1 Peoria connecting rod alignment jig.
2 Peoria motor block supports.
Ignition Repair Tools:
1 Ford remagnetizer, Vim unit type or Ford remagnetizer.
1 Igni-test outfit.
1 Weston, Hoyt or Ambu testing set.
1 Ambu Cadmium testing outfit.
1 Battery charging set, H. B. 8—Battery type.
Storage battery repair equipment—Ambu.
1 Universal test stand (for testing any make of generator or starting motor).
2 Hydrometers—Break Not.

Tire Repair Equipment.

Rim tools—Lawco.
Vulcanizing outfit—Miller, Anderson, Weaver.
5-minute Shaler gang.

Vulcanizer.

Michelin Mastic.
Tube repair material.
Rubber worker's tools—Miller.

First Aid Cabinet.

Antiseptic cotton.
Roll bandage.
Adhesive tape.
Court plaster.
Iodine.

Supplies.

Valve grinding compound, coarse and fine.
Prussian blue.
Time-saver, bearing compound.
Emery cloth, No. 00, No. 0, No. 1, No. 2.
Crocus cloth.
Sandpaper, No. 0, No. 1.
Waste.
Cup grease.
Graphite grease.
Cylinder oil, medium and heavy, 600-W.
Gre-day or other transmission lubricant.
Kerosene.
Gasoline.
Solder—bar and wire.
Soldering paste.
Muriatic acid.
Babbitt.
Screws, all sizes, U. S. std. & S. A. E.
Nuts, all sizes, U. S. std. & S. A. E.
Stove bolts, all sizes, U. S. std.
Washers, all sizes, U. S. std.
Carriage bolts, all sizes, U. S. std.
Lock washers, all sizes.
Wing nuts, all sizes.
Cotter Pins—Campbell's garage assortment, 3,000 pins.
Taper Pins—1 assortment.
Whitney Keys—1 assortment.
Nails and brads.
Tacks.
Upholstery tacks and staples.
Brake lining rivets.
Iron rivets, various lengths.
Gasket material, gasket assortment.
Shim stock.
Shellac.
Whitelead.
Rim paint.
Aluminum paint.
Brushes.
Distilled water.

If by chance there is a large tool works in the city or close by it is possible to buy wrenches, etc., with small nicks, etc., on them which do not impair their usefulness one particle, but which hurt their selling qualities, as seconds at very low prices. For instance, the author bought seconds in end wrenches at four cents a pound, vises at a large reduction, a popular make of adjustable wrench at one-third the selling price. The wrecking companies will yield examples of every part of a car, as cylinder blocks of various types, etc., at junk prices.

Much in the way of charts, samples of piston rings, bearings, sectional spark plugs, oil displays, tire sections, booklets (in quantities) for distribution, etc., can be obtained gratis thru dealers or manufacturers. It would be easily possible to append a list of two hundred sources of such material but rather than have the manufacturers "jump on me", said list will be omitted. Any instructor that can "rustle" any material at all can readily obtain any amount of this gratis teaching material. I know because I have "rustled" everything from a piston ring to an engine. It can be done. Dealers and manufacturers are always willing to cooperate with the schools because it is a good source of advertising for them.

That automobile instruction is being recognized can be shown by the large percentage of summer schools for vocational teachers which include it in their list of courses. Practically all the schools of California are including this work. In fact, while I have never heard it stated authoritatively, yet, all indications point to the fact that California schools lead in the number

that have included automobile instruction as part of their manual arts or vocational work. As just an indication of other schools which have automobile courses, the following list illustrates the fact that many school systems have realized the need for such instruction.

Public Schools.

David Ranken School of Trades, St. Louis, Mo.
Elm Vocational School, Buffalo, N. Y.
East Jr. High & Academy High Schools, Erie, Pa.
West Technical High School, Cleveland, Ohio.
Grant Vocational School, Cedar Rapids, Iowa.
Ft. Dodge High School, Ft. Dodge, Iowa.
Prevocational School, Des Moines, Iowa.
San Antonio High, San Antonio, Texas.
Dunwoody Institute, Minneapolis, Minn.

Commercial Schools.

Michigan State Automobile School, Detroit, Mich.
Detroit Institute of Technology, Detroit, Mich.
Cleveland Automobile School, Cleveland, Ohio.
Sweeney Automobile School, Kansas City, Mo.
Rabe Automobile School, Kansas City, Mo.
Y. M. C. A. Schools, New York, N. Y.
Y. M. C. A. Schools, St. Louis, Mo.

There is every reason why this work could be thoroly presented thus preparing the boys for gainful employment. As a general rule the boys who have the advantages of such training step out and make real men in the automobile "game" reflecting to the credit of automobile instruction as one way of conforming to the needs of one of the country's great expanding industries.

(To be concluded.)

MAKING A MERRY-GO-ROUND

(A CHRISTMAS PROJECT.)

L. A. Herr, Supervisor Elementary Industrial Arts, The Lincoln School of Teachers College.

IN each of our grades Christmas plans were discussed by teachers and pupils and suggestions were made for many types of activity. In the fifth grade many kinds of things were proposed, including individual work and group projects. Among the latter the making and repairing of toys, to be given to other children thru some organized agency, and the raising of funds by means of a bazaar, were proposed.

When the larger and truer aims of Christmas giving were presented to the fifth grade they felt that their best contribution might come from a united effort on one large problem. Among the several possibilities discussed for this purpose, the making of a merry-go-round was finally enthusiastically adopted.

The method of setting about the work was very direct. The logical-thinking adult would doubtless have proceeded in a very different way from that followed by this class. He would first have found the person or group of people in need; then he would have made plans to meet the need. In the case of the fifth grade the order of procedure was different. Children are keen to be doing something. In their eagerness to be actively engaged they frequently fail to look far ahead, and they apparently do not mind making new plans or taking a fresh start if it becomes necessary. To have decided upon the making of a merry-go-round was for them sufficient to want to begin it at once. Preliminary work was therefore reduced to the minimum. A general agreement as to the size and proportions of the merry-go-round was first made. There was to be a revolving turntable about four feet in diameter; it was to carry eight pairs of animals about nine inches in height with seats between; the top was to be like a tent, and the construction was to be such as to make possible the taking down and later reassembling of the whole.

TYPICAL HORSES AND CAMELS FOR MERRY-GO-ROUND.

Committees were formed to carry out the different divisions of the work. In forming these committees it was possible for each pupil to choose the type of work that appealed to him. One group preferred to make the animals; another wanted to do the framework construction; and another wished to secure and install power for propelling the turntable. The question as to what was to be done with the completed merry-go-round was not raised until several days later. Then after considerable debate by the members of the class it was decided to present it to our own first grade. It was thought that this grade would study animals at some time before the end of the year. Then, some of the pupils in the fifth grade had brothers or sisters in the first grade, which brought a personal interest into the situation. Secrecy was enjoined upon all for "we are making this for the first grade and we want it to be a surprise."

Cooperation with the fine arts department was secured and several lessons were given to the drawing and the designing of the animals and to the applied color decorations. From pictures of animals by noted animal painters, and from line drawings made by the drawing teacher, many different kinds of animals were drawn by the pupils. Correct form, size, and vigorous action were first aims. This was followed by a squaring up of the lines to better adapt the shapes for sawing. From all the designs prepared in this way the class selected

those they thought best suited for the purpose. These designs were then transferred to the wood by means of carbon paper and then sawed out by the members of the committee in charge of this part of the work. In succeeding drawing lessons, the whole class worked out color schemes for the animals using colored crayons on the original accepted drawings. The colors were painted on the animals in the following drawing lessons.

Meanwhile construction work was going on in the industrial arts time. One group of pupils sawed out the animals with coping and backsaws, sandpapered them and made them ready to paint. Another group made the seats which separated each pair of animals, and the supports which fasten them to the turntable. Another group worked at the lower framework, while still another was busy with the support for the umbrella-shaped canopy.

The canopy itself, consisting of a top with a scalloped edge, and the lower fringed border, were made by a group of girls under the direction of the teacher of household art. This work involved the drafting of patterns, the cutting of the muslin from the patterns and the sewing of these parts on the sewing machine. These parts were completed by the application of a color decoration. Designs for this purpose were made by the whole class. When a choice of the designs had been made, two children were chosen to apply it to the material. From the small nine by twelve sketch, the pupil made an enlarged copy on the canopy and edgings in charcoal. It was then painted with oil colors. As a finishing touch another pupil designed and painted a pennant for the top. This was used to take the place of a flag which was first suggested for this position.

The groups of children worked alone very much of the time since it was not possible for either the classroom teacher or the special teachers to be present excepting at irregular intervals. The supervision at such times consisted largely in seeing that the leaders of the groups understood exactly the nature of their several tasks and that their ideas were reasonably clear as to a method of procedure. Freehand blackboard sketches were made as the work progressed in order to place vividly before the pupils some of the necessary constructions and to give definiteness and unity to their efforts.

The major portion of the work was done in a small crowded workshop, with an occasional overflow of pupils into the adjacent classroom and corridor. The difficulties arising from working in a crowded space, however, did not dampen the spirit and enthusiasm of the class in the work. Making the merry-go-round was the one absorbing interest of the class during the whole period in which the work was accomplished. Extra periods were requested, and recreation periods were

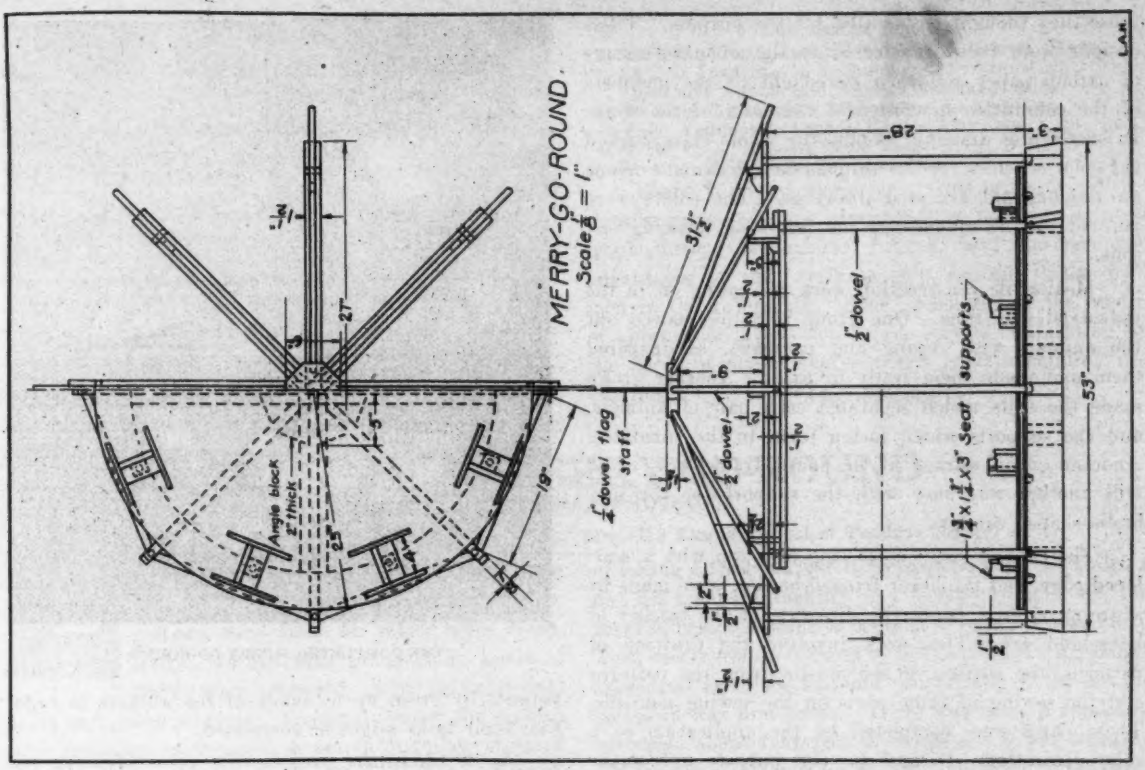
THE COMPLETED MERRY-GO-ROUND.

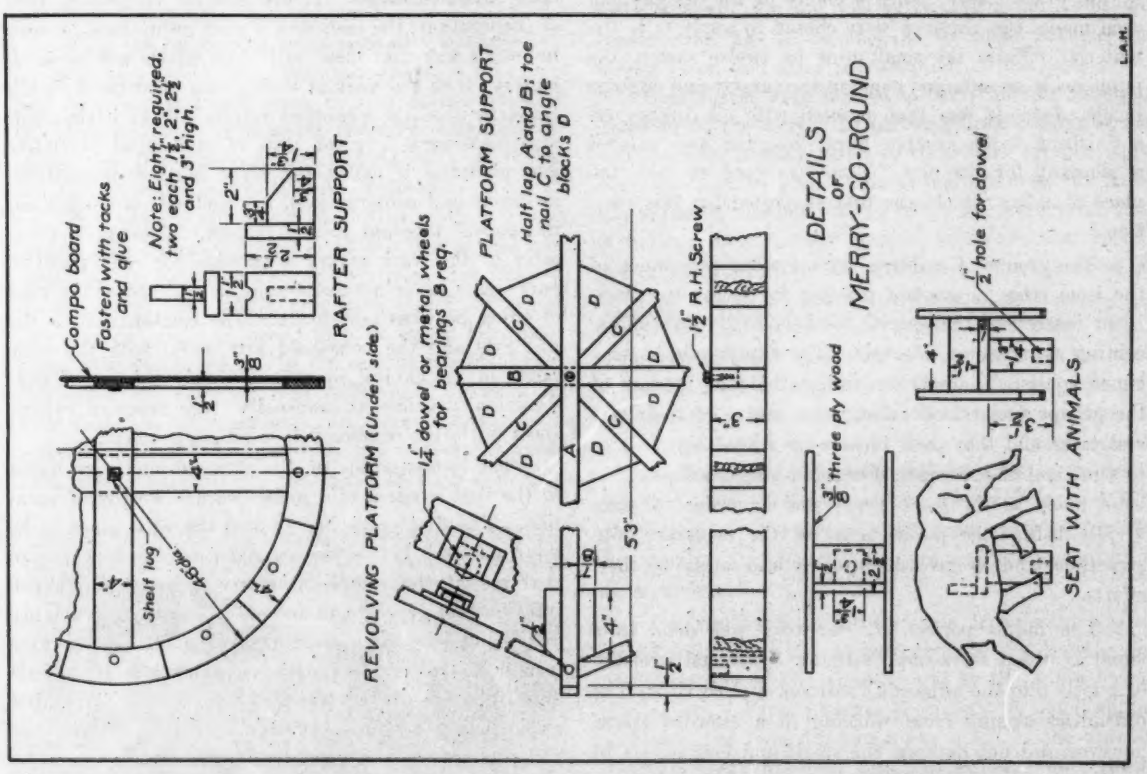
voluntarily given up by many of the workers in order that their tasks might be completed.

As a Christmas project this piece of work has many distinct values. It provides for the fullest kind of cooperation; the members of each group have to work in such a way that their individual efforts will be satisfactory; then the work of each group must be of such a character that the combined results will be harmonious and pleasing. A great deal of individual initiative and planning is called for, since neither detailed dimensions and constructions, nor methods of work limit the pupils' freedom in any respect. The varied character of the work makes it possible for each pupil to participate whole-heartedly since he will choose the kind of thing he likes best to do. The combination of the fine arts and the household arts work, with the wide range of mechanical operations involved in wood construction, provides an unusually large range of experiences not often combined in a single problem.

The presentation of the finished merry-go-round to the first grade was a social feature worthy of mention. The first grade had invited the fifth grade to be their guests. It was so arranged by the teachers in charge that the completed merry-go-round was taken into the first grade room and set up during the absence of the pupils. After their return the fifth grade came in and a formal presentation was made. A social half hour followed during which the members of the first grade acting as hosts, served a luncheon which they had prepared to the members of the fifth grade.

At a bazaar held near the close of school the merry-go-round was sold, together with many other articles made by pupils of all the classes. The final disposition of the merry-go-round was not definitely de-




Compo board
Fasten with tacks and glue
Note: Eight 1½", 2", 2½" and 3" high.
RAFTER SUPPORT
REVOLVING PLATFORM (Under side)
Shelf lug
¼" dowel or metal wheels for bearings 8 req.
PLATFORM SUPPORT
Halt lap A and B; toe nail C to angle blocks D
1½" R.H. Screw
53"
DETAILS OF MERRY-GO-ROUND
⅜" three ply wood
½" hole for dowel
SEAT WITH ANIMALS

DETAILS OF CONSTRUCTION OF MERRY-GO-ROUND.

termined, however, until the matter had been discussed with the fifth grade and their full approval of the sale of their Christmas gift obtained.

Kinds of Material Used.

For lower framework, ⅜" poplar.
For braces in central framework, 2" poplar.
For posts and canopy ribs, ½" dowels.
For cross pieces and rib supports in top, ½" poplar.

CORRECTION: Column 2, lines 15, 23.
Read: Bergen & Caldwell's Essentials of Botany (Ginn).

For turntable, compo board.
For turntable stiffening segments and cross pieces, ½" poplar.
For center pivot 1½" round-headed screw.
For pivot center, the hollow side of a metal shelf support.
For roller bearings at outer edges of turntable, 1" dowel.
For framework of roller bearings, ¼" poplar.
For canopy, white unbleached muslin.

Color Scheme Selected.

For canopy, body color white, designs green and red.
For turntable, French gray.
For framework and dowels, black.
For projecting ends of lower frame, red.
For seats, French gray.

Colors for Animals.

Four lions: body yellow, mane brown, saddle green.
Four elephants: body gray, saddles green with red borders.
Two ponies: body black, mane and tail white, saddle black.
Two bears: body gray, saddle green with yellow spots.
Two camels: body brown, saddle red with yellow stripes.
Two ponies: body white, mane and tail black, saddle black.

RECONSTRUCTION COURSES—VIII.

AGRICULTURE

Charles R. Miller, Williamson, Pa.

THE study of agriculture is one of the most interesting, as well as the most important and essential of the occupations offered to the rehabilitation student today. It is also one of the best adapted to the physical needs of the student as the work permits him to be in the open air the major portion of the time.

There were many difficulties to meet and obstacles to overcome before a course could be outlined that was elastic enough to meet the demands of our students. There was such a great variation in preliminary education that it was necessary to make many special text assignments before the individual students could understand the principles involved. In most cases individual instruction is required; group instruction being practical only in some phases of the work. Interest has to be created and maintained and no detail to this end is omitted.

There are several different subjects to cover under each course, the texts and practical work assignments of each being chosen to best develop the good judgment, self-reliance, and initiative of the students.

The four separate courses given at the Williamson Trade School are Greenhouse Practice, Animal Husbandry, Farm Mechanics and Tractor Operating, and Poultry Raising and Bee Keeping. The complete outline of each course follows.

GREENHOUSE PRACTICE.

Summary of Course—Twelve Months.

The first three months of this course is devoted to elementary study and practice of greenhouse projects. The work includes seed and soil selection, planting and developing a variety of vegetables which may be grown in the greenhouse. Botany and farm arithmetic are taken as related subjects.

During the second three months the time is devoted particularly to floriculture. The varieties of flowers to be grown and marketed at particular seasons of the year are studied and practice applied. Harvesting and marketing of flowers studied. Botany and farm arithmetic continued as related subjects. Elementary woodwork is introduced as a related subject during this period.

During the third three months the time is devoted to study and practice of greenhouse management. Botany and farm arithmetic continued as related subjects. Elementary woodwork is replaced with plan sketching and reading as related to greenhouse construction.

During the fourth three months the study of greenhouse construction is taken up. Various types of greenhouses studied, construction of hot beds, cold frames, forcing pits and similar details as related to the learner's work. This work is correlated with the detailed study of construction as applied at the school farm. Botany, farm arithmetic, and plan sketching, continued as related subjects.

The following textbooks are used in the course:
Kain's Plant Propagation, Greenhouse and Nursery Practice.
Henderson's Practical Floriculture.
Taft's Greenhouse Management.
Taft's Greenhouse Construction.
Bergen's Elements of Botany.
Burkett & Swartzel's Farm Arithmetic.
Read a good farm paper regularly.

Gardening and Greenhouse Practice.

The purpose of this course is to give a practical understanding of the elementary principles of gardening and greenhouse work.

Botany—One hour per week.
Text—Bergen's Elements of Botany.
Greenhouse Construction—One hour per week.
Text—Taft's Greenhouse Construction.
Principles studied in relation to construction of greenhouse at school plant.
Floriculture—One hour per week.
Text—Henderson's Practical Floriculture.
Landscape Architecture—One hour per week.
Text—Parson's The Art of Landscape Architecture.
Greenhouse Management—One hour per week.
Text—Taft's Greenhouse Management.
English—Two hours per week.
Text—Claxton's and McGinniss Effective English.
Plant Propagation—One hour per week.
Text—Kain's Plant Propagation, Greenhouse and Nursery Practice.
Mathematics—Five hours per week.
Text—Burkett and Swartzel's Farm Arithmetic.
Laboratory Work—Three hours per week during one year.
Text—Gehr and James' Exercises in Agriculture.
This is to embrace the twenty-six (26) experiments from Gehrs and James on soils. The fifteen (15) experiments on plant propagation, are also to be taken in this connection.
Vegetable Gardening.
Text—Watt's Vegetable Gardening.
The study of this text is assigned at appropriate time for cooperation with outside work program.
Construction Practice—Two hours per week.
Learners should become familiar with classification of nails, screws, brads, butts, hinges, latches, glass, expansion bolts, lag screws.

SOLDIER-STUDENTS IN THE GREEN HOUSE.

The use of rip saw, cross-cut saw, block plane, jack plane, square for layout and testing (no work in cuts, brace measure, etc.) and common chisels, brace and bit, and other common tools taught.

The following projects made up; the work must be accurately done.

Three of the principal joints used in construction work should be made up to give the student an elementary knowledge of tools and manual control. The work should be accurate, one of the aims being to teach the learner to work to dimensions. Following this work each learner is to make either a flower tub or stand as outlined below:

Tubs and stands to be square in plan. Two sizes of tubs, one 18 inches square by 18 inches deep, and one twelve inches square by twelve inches deep. Two sizes of stands, one twenty inches square by eighteen inches high, and one fourteen inches square by twenty-four inches high. Each man is to make either a stand or a tub. It is suggested that men be assigned in parties of two, as far as possible, one man making the tub, and the other the stand, which is to be assembled in a unit. The piece made is to be painted dark green by party building same.

As group projects to follow this work, if time is available, the following will be constructed:

A rustic bridge to be six feet wide and eight feet long with an earth floor. Fence and gateway leading to this bridge, but no gate. A set of rustic steps with railing.

Sketching—Applied Geometry—Two hours a week.

All work in sketching freehand. The geometrical problems are to be laid out in the open so that student has an opportunity to work with large trammel, pins and lines. The bed on which the layout is made should be level, and made up of cinders, well tamped. The purpose of this geometrical work is to teach the learner how to lay out the various forms used in landscape architecture.

The following geometric problems are to be executed:

1. Bisect a straight line. 2. Bisect arc of a circle. 3. Bisect an angle. 4. Lay off an angle equal to a given angle. 5. Lay out a triangle, sides of specified length. 6. Lay out a square, locating sides by erecting perpendiculars. 7. Lay out a hexagon. 8. Lay out an octagon. 9. Lay out a pentagon. 10. Lay out a five point star. 11. Lay out an ellipse.

Drawing—Two hours a week.

The work is entirely free hand orthographic sketching.

Sketch No. 1—The drawing of a box; elements of projection explained.

Sketch No. 2—The drawing of a flower pot, giving two views and all dimensions.

Sketch No. 3—Drawing of pins used in geometrical work; two views and all dimensions.

Sketch No. 4—Drawing of straight edge used for leveling; two views and all dimensions.

Sketch No. 5—Drawing of lawn tub used on lawn stand project.

Sketch No. 6—Drawing of base used on lawn stand project.

Practice Work—24 hours a week.

This work aims to give the student practical experience in greenhouse and garden work. At appropriate seasons of the year the student is assigned as follows:

Seeding, plant forcing, slipping plants, hot house, care of plants, including potting, watering and spraying; operating hot house heating plant, hot bed work, transplanting, making up lawn flower beds. Care of beds during growth and maturity. Beds to be regularly raked and watered, old blooms and leaves picked off. Same care of all lawn stands, and hedges. Cutting of shrubs and pruning of trees.

The various elements of practice as outlined in botany, floriculture, greenhouse management, landscape architecture, plant propagation, carried out as greenhouse or lawn projects.

Keeping of various greenhouse records introduced, presenting systematic arrangement of seasonal activities for this class of work.

Practical work in trucking, including small fruits, such as berries and grapes.

During this course lectures are given as follows:

One on "concrete", 90 minutes.

Mixing of concrete by hand; ingredients used and proportions of same. Form construction; time elapsing before stripping forms. Using steel or pipe for reinforcing concrete. Method of preventing concrete sticking to forms. Proper finishing of forms where nice work is required. Method of placing concrete, spading, and tamping; patching concrete work. Student to turn in a report on lecture.

One lecture on "piping", 90 minutes.

The various fittings described; each fitting exhibited; tools used in pipe fitting; each exhibited and explained. Method of making up a coupling and union joint explained, and demonstrated. Student to turn in a report on lecture.

One lecture on "painting", 90 minutes.

Common ingredients; proper method of mixing; thinning paint; classification of brushes and care of same. Proper methods of applying paint, varnish, and shellac. The treatment of knots, placing of priming and finishing coats. Student to turn in report on lecture.

Supplementary Reading.

Hay's Modern Fruit Marketing.
Waugh's Systematic Pomology.
Kain's Making Horticulture Pay.

Animal Husbandry.

The purpose of this course is to give an elementary training in the breeding, care, and development of domestic animals. The first six months of the course are devoted to dairying and beef cattle.

Animal Judging—One hour per week.
Text—Craig's Judging Live Stock.
Dairy Farming—One hour per week.
Text—Eccles and Warren's Dairy Farming.
Feeding—Dairy Cattle—One hour per week.
Text—Henry and Morrison's Feeds and Feeding.
Farm Buildings—One hour per week.
Text—Eckblaw's Farm Structures.
Testing as Related to Dairy Practice—One hour per week.
Text—Van Slyke's Modern Methods of Testing Milk and Milk Products.
Dairy Practice—One hour text study and 24 hours' practice.
Text—Larson's and White's Dairy Technology.

During the practice period the student is assigned to work in the dairy. He applies in practice here, the information gained in study of the text in the classroom.

Assignment of six two-week periods in care of a herd and young stock. Practice work should include cleaning, bedding, feeding, and upkeep of plant.

Dairy practice is to gain experience in dairy sanitation, handling of feeding rations, keeping dairy records, learning to milk by hand and machine. The student is to apply in practice the important elements set forth in dairy farming and dairy technology in so far as they relate to the herd and herd room.

Assignment of six two-week periods in the creamery. Practice work should include the complete process of butter making, using the hand and power separators, sanitation as applied to dairy utensils, and milk testing.

The second six months of the course is devoted to hog raising and hostelry.

Animal Judging—Two hours per week.

Text—Craig's Judging Live Stock.

Farm Development—One hour per week.

Text—Hay's Farm Development.

Sanitation—One hour per week.

Text—Santee's Farm Sewage.

Farm Records and Accounts—One hour per week.

Text—Otis' Farm Accounts.

Drainage—One hour per week.

Text—French's Farm Drainage.

Fertilizing—One hour per week.

Texts—Thorne's Farm Manures, Van Slyke's Fertilizers and Crops.

Practice—Twenty-four hours per week.

A period of two weeks in successive assignments to be made to the horse barn, swine house, and general farming. In these assignments the student is to put into practice the principles outlined in the texts studied.

Related Subjects—Two hours per week.

General Construction.

The student should become familiar with tools and supplies necessary for farm work; classification of nails, screws, brads, butts, hinges, latches, etc. The use of rip and cross-cut saws, planes, square, and other common tools he will be required to use. Three elementary abstract projects made up to develop knowledge of measurement and manual control. Suggested: half-lap joint, housed joint, mortise and tenon joint.

Practical work is then carried out on such projects as milking stools, stepladders, drag sleds and other small farm equipment. After these projects are completed the student is assigned to repair work on the farm. This class of work includes repairs to floors, doors, gates, fences, feed boxes, etc.

Sketching—Two hours per week.

All of the work is to be freehand and is to embrace the principles of orthographic projection.

Working sketches of (1) milking stool, (2) stepladder, (3) a farm gate, (4) feed boxes for young stock, (5) drag sled, (6) a concrete fence post, (7) form for concrete fence post, (8) a portable pig house.

English—Two hours per week.

Text—Claxton & McGinnis Effective English.

Mathematics.

Text—Burkett & Swartzel's Farm Arithmetic.

FARM MECHANICS AND TRACTOR OPERATING.

This course aims to give a fundamental understanding of the construction of modern farm implements. Sufficient practical work is involved to enable the student to make proper repairs on this class of machinery. Particular stress is laid on the importance of substantial repairs. While make-shift methods may be used temporarily in the field, they must never serve as a substitute for permanent repairs. Elementary mathematics, English, and orthographic freehand sketching are introduced as related subjects.

SOLDIER-STUDENTS HARVESTING GARDEN TRUCK.

Farm Machinery—Six hours a week.

Text—Davidson and Chase's Farm Machinery and Motors.

The study of this text is to be taken in intimate contact with the various implements. Each implement as studied in the text is seen in school equipment as far as possible. Details should be fully explained, and implement dissembled in cases where construction cannot be studied in assembled arrangement. Operation of various machines.

During first three months cover chapters 1, 2, 3, 4, 5, 6; during second three months cover chapters 7, 8, 9, 10, 11 (review briefly the work previously done); during third three months cover chapters 12, 13, 14, 15, 16, 17 (review briefly work previously done); during fourth three months cover chapters 18, 19, 20, 21, 22 and review the book.

Automotive Machinery—Four hours a week.

Text—Page's Auto Repairing Made Easy.

During first three months cover chapters 1 and 2, study the tables given in the closing section of the text.

During the second three months cover chapters 3 and 4, taking review of chapters 1 and 2.

During third three months cover chapter 5.

During fourth three months cover chapter 6, and review all material taken previously.

In study of the text, the work should be taken with a car available as equipment.

Freehand Orthographic Sketching—Four hours a week.

Note—Instruments used only in working geometrical problems. No work inked in.

Sheet No. 1.

1. One section par. hor. lines.
2. One section par. vert. lines.
3. One section par. ang. lines to right.
4. One section par. ang. lines to left.
5. One section par. ang. lines cross sectioned.
6. Four circles.
7. Two ellipses.
8. One section of parallel alternate dot, dash and full lines.
9. Four squares drawn in a section. Inscribe a square within each of these squares, one-half inch smaller in diameter than larger square. Join corners of all squares with circular arc.
10. Draw three circles tangent to each other; draw in raditt passing approximately through points of tangency.

Sheet No. 2 is assigned to development of a good slant alphabet and set of figures. Both capitals and lower case to be practiced. Title in lower right-hand corner of sheet. The remainder of the sheet is to be devoted to drawing the standard sections showing the conventional methods of representing various materials. All of the work on this sheet is to be freehand.

Sheet No. 3—Problem.

1. Bisect a straight line.
2. Bisect arc of circle.
3. Bisect angle.
4. Lay off angle equal to given angle.
5. Lay off angle and bisect, using protractor.
6. Lay out triangle; sides of specified length.
7. Draw tangent to a circle, and locate point of tangency.
8. Draw a square, erecting perp's by geometrical method.
9. Draw a hexagon.
10. Draw an octagon.
11. Draw a pentagon.
12. Draw an ellipse; use trammel method.

The purpose of these problems in this course is to apply the principles of geometry; to lay out problems met with in the machine shop. The T-square should not be used in their construction. Instruments should be limited to triangles, dividers, compass, and irregular curve.

Sheet No. 4—Problem.

Devoted to the elements of projection in third-angle work only. All models should be simple machine parts secured from the shops.

1. Front, top, and side view of a simple shape without dotted lines. Suggested—step block.
2. Same introducing dotted lines. Suggested—sliding parallel bar.
3. Same introducing a section. Suggested—lathe cross side.
4. Bolt with hex, head and nut using conventional method of thread representation. Dimension bolt and nut for all necessary measurements.
5. Three views of a standard six-inch pulley; oil hole, key way, and amount of crown shown .
6. A working sketch of the center support used on a milling machine. This to be sketched complete, showing all detail parts.

Note—These six problems in projection are to be on one sheet.

This course is completed during the first year. If the assigned work is finished before the end of the year, freehand sketching is discontinued as an assigned study, and the time devoted to other subjects.

Shop Practice—Twenty-four hours a week in Machine Shop.

First Three Months use of scale, caliper, divider, speed indicator, micrometer, steel stamps, vernier. Chipping, filing, including draw-filing, lead hammer, hack saw, scraping to bearing, surface and cylindrical babbitting, laying out. The ratchet, using size, reamer, tap, and pipe tap, drills; pipe fitting; classification of pipe fittings; belt lacing, making knots and hitches, screw gauge, sizes and classification of screws; lock washer, size and classifications; soldering, sweating and brazing.

The general care of machine tools in cleaning and oiling.

In chipping and filing, work is to be done in machine, steel, tool steel and gray iron.

Drill press work to include size, reamer, tap and pipe tap drill work. General run of shop jobs to be taken on drill press for a period of one week.

Forge work is to include making of chisels, side tools, parting tools and welding.

During shop periods of first three months the student should be assigned at least four hours each week to truck driving practice. In this connection he should become acquainted with all the major and minor parts of the truck.

Second Three Months are devoted to study of gasoline motor. Complete disassembling of motor, and study of each part. Any necessary repairs made; timing of valves studied, and properly carried out, motor assembled, all necessary adjustments made, and motor operated.

Lathe work is taken during this period including centering, facing, straight turning, shouldering, filletting, filing, right and left hand thread cutting, including calculations for proper gears.

At least two hours a week driving practice continued thru this period. (Machine Shop.)

Third Three Months are devoted to the electrical equipment of automotive machinery. The storage battery analyzed. Practices in setting up primary cells in various combinations as shown in Page's "Auto Repairing"; charging a storage battery; testing electrolyte. The mercury arc rectifier studied in light of its operation and application to storage battery charging. A visit should be made to a neighboring garage for this study. "Trouble shooting" introduced by means of deranging parts of electrical system of car. Starting motor and generator studied as units; methods of wiring same taken up.

Fourth Three Months are devoted to the tractor.

Text—Page's Gasoline Tractor.

Sufficient time is devoted to operation to learn maneuvering and running. General construction and electrical equipment are studied. Sufficient dismantling taken to assure an understanding of the machine as a whole.

Oxy-acetylene welding and cutting taken during this period.

Related Subjects.

English—Two hours per week.
Text—Webster's English for Business.
Mathematics—Five hours per week.
Text—Dooley's Vocational Mathematics.

POULTRY RAISING AND BEE KEEPING.

The purpose of this course is to give the learner an elementary understanding of the care, development and disposal of poultry and bee products.

Poultry Culture—One hour per week.
Text—Robinson's Principle and Practice of Poultry Culture.
Poultry Diseases—One hour per week.
Text—Wortley's Poultry Diseases.
Buildings—One hour per week.
Text—Fiske's Poultry Architecture.
Records and Accounts—One hour per week.
Text—Otis's Farm Accounts.
Bee Keeping—One hour per week.
Text—Phillipps' Bee Keeping.
Turkeys and Their Care—One hour per week.
Text—Myrick's Turkeys and How to Grow Them.
Ducks and Geese—One hour per week.
Text—Orange Judd Co. Booklet on Ducks and Geese.
English—Two hours per week.
Text—Claxton and McGinniss Effective English.
Mathematics—Five hours per week.
Text—Burkett and Swartzel's Farm Arithmetic.
Classification and Judging Poultry—Two hours per week.

Text—Drevenstedt's American Standard of Perfection.

Practice—Twenty-four hours per week.

The practice work in this vocation is taken in the poultry plant and apiary. The important principles presented in the various texts studied are applied in practice and results observed. Prescribed record systems are kept in connection with the work, and possible profits calculated. During this assignment to practice, the learner should be given at least one week, every two months, on general farm work, becoming acquainted with machines and tools used for planting, harvesting, and similar work.

Sketching—Two hours a week.

The elementary principles of projection are taught; all work is freehand orothographic sketching. Full working sketches made of each are following:

Chick feed trough.
Water fountain.
Nests used in poultry houses.
Colony houses at poultry plant.
Hive used in apiary.

Construction—Two hours a week thru one year.

The student is given a knowledge of classification of nails, screws, butts, locks, hinges, latches, and such other equipment as is used for repairs about a poultry plant.

Practice is given in use of rip and cross-cut saw, jack plane, square for testing and such general tools as may be necessary for use on repairs about a poultry plant.

Three of the principal joints used in construction work should be made up to give the student an elementary knowledge of tools and manual control, following which the projects outlined below are given:

Each two men to build a feed trough.
Each four men to build a step ladder.

Following this work men are assigned to general repair work about the poultry plant, giving attention to upkeep and building such new structures as may be needed.

THE HOUSE AND THE BOYS WHO BUILT IT.

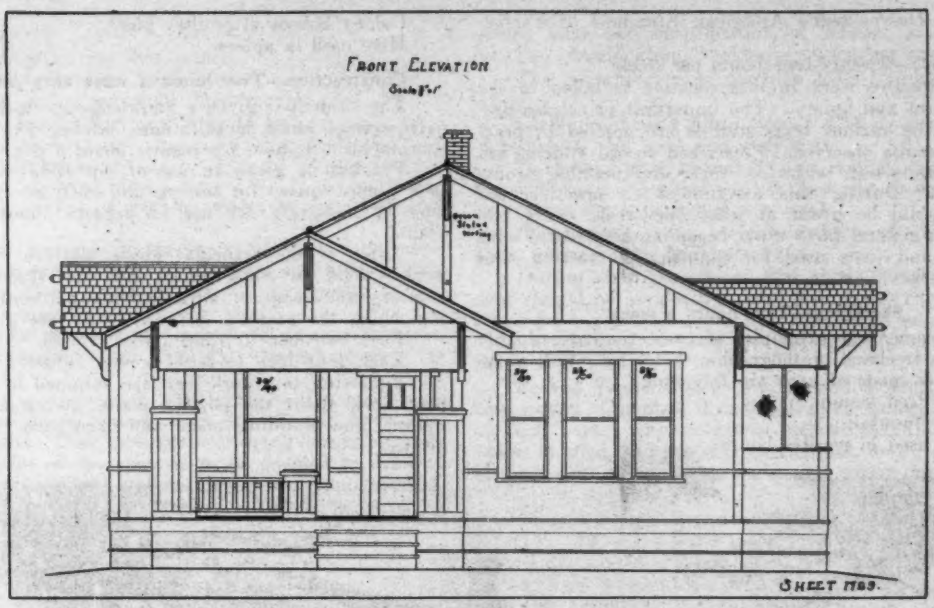
House Building Project at the John Tarleton College Stephenville, Texas

E. A. Funkhouser, Director

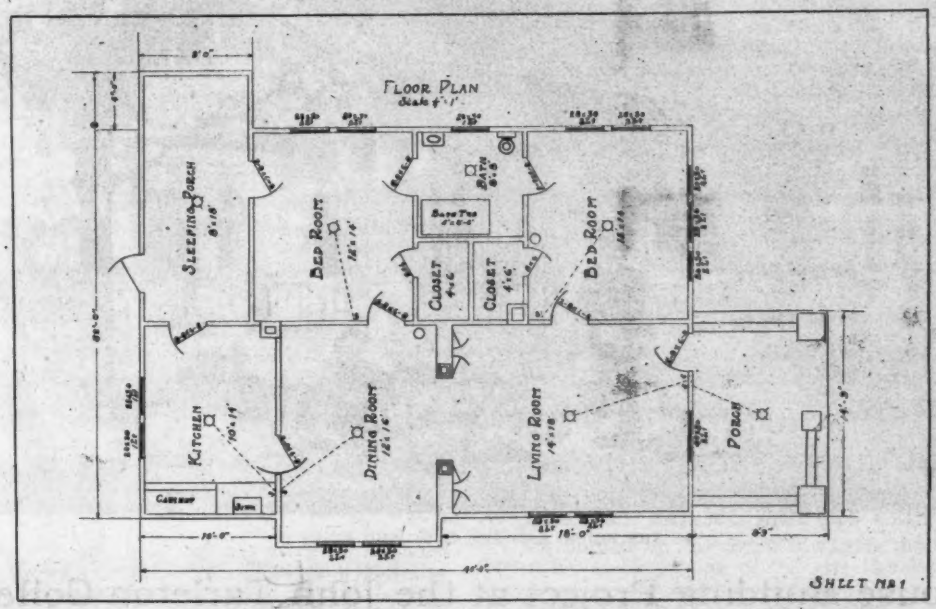
ON account of location of the John Tarleton School in the heart of the oil belt of Texas, it was realized during the summer of 1919 that a splendid opportunity was offered in putting on trade work, preparing carpenters to supply the demands of the oil industry. Many of the boys who had been taking the manual-arts course in the college were employed during the summer at good wages to do such carpentry work as they knew. They realized the need of real trade instruction, hence were eager to enter the class when it opened in September as a Smith-Hughes class in carpentry.

Every house in Stephenville was occupied and many more needed, therefore it was easy to carry on the work in the proper way by working the boys on the job.

Arrangements were made whereby the boys could build a house on a nearby lot for the instructor. The accompanying photographs show the result of their efforts which is a good substantial house worth, at present prices, about $5,000. When school opened a class of twelve was enrolled. The work was so planned that the boys should give twelve and one-half hours of actual labor on the house per week. During the first two weeks



STUDENT'S DRAWING OF FRONT ELEVATION.



STUDENT'S DRAWING OF FLOOR PLAN.

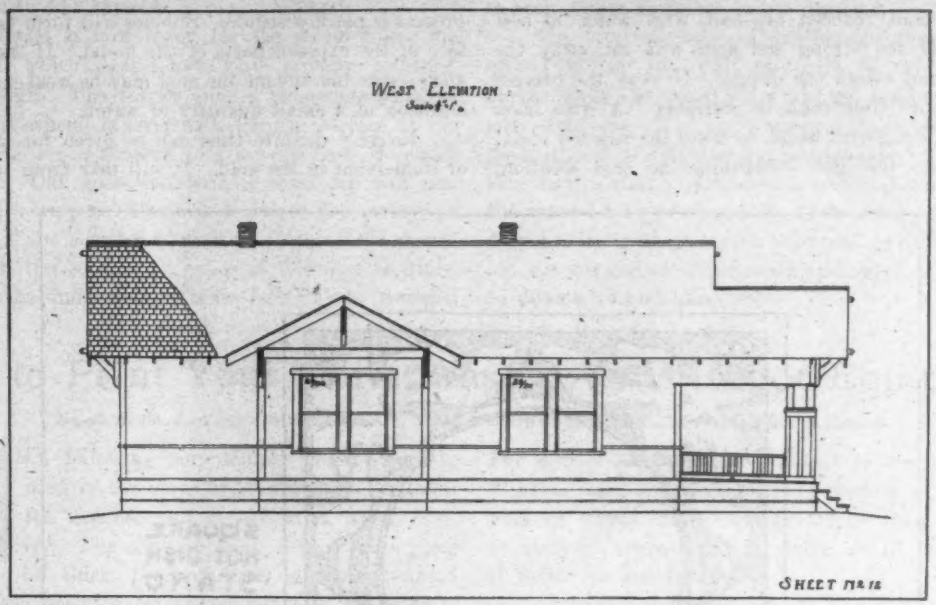
of school a part of the time was spent by the class in inspecting a number of new houses being built and in designing the plans for the one to be built. This was done during the drawing period.

The first of October found the plans decided upon and the material on the ground. The house was then laid off. And with the exception of the brick mason who built the brick foundation and flues, the entire work on the house was performed by the boys and the teacher.

The boys entered into the work with a great deal of interest and when the house was finally completed the latter part of February, nine of the boys were still on the job. Three had found the work a little too strenuous to suit them.

The house consists of two bedrooms each 12x14′, living room 14x18′, dining room 12x16′, kitchen 10x14′, bath 8x8′, two closets 4x6′, sleeping porch 8x18′, front porch 10x15′, also two built-in bookcases and a large built-in kitchen cabinet. The house was built on the bungalow style and conforms in every way, both inside and out, to the best methods of carpentry employed in this section of the country.

All the work periods in good weather were spent out of doors on the building site. When it was raining, or too cold, for a few days, the work was carried



STUDENT'S DRAWING OF SIDE ELEVATION.

on in the school shop. All window and door frames, brackets, built-in fixtures, and porch columns, were made in the shop and taken to the building as needed. In this way no time was lost.

Whenever a new problem came up, the class was given proper instructions before beginning the work. It was really remarkable how few mistakes and wasted pieces of lumber there were.

Of course, the instructor ran somewhat of a risk in furnishing the material for the work, but after it was completed it proved to be a very good investment and both he and the boys are proud of their job.

In addition to building this house a great deal of repair work was done for the school. A bath house was also built on the school grounds and several cabinets were constructed for different departments.

A HOT DISH STAND

C. H. Richert and Otis Philbrick.

THE article described herein consists of an etched metal plate screwed onto a wooden base. It will serve, not only as a means of protecting the table top from being marred by hot dishes, but also as a distinct addition to the ornamental appearance of the table.

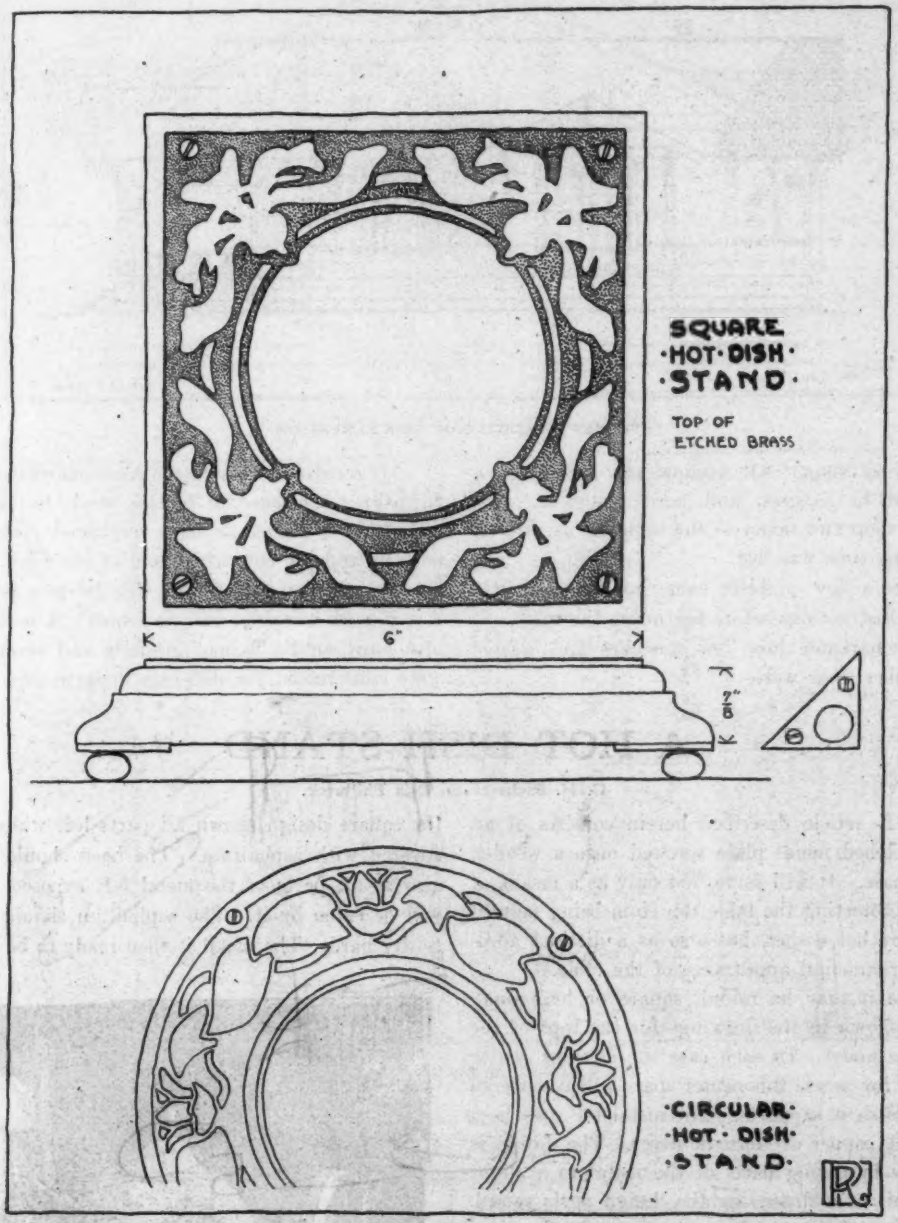
In shape it may be round, square or hexagonal. Designs are shown in the drawings for the tops of the two first mentioned. In each case the circular center is left empty for in use this center space will be covered by whatever dish it supports. The metal top may be a sheet of brass, copper or German silver. The design is made on this by eating parts of the metal to a slight depth with nitric acid, leaving the design parts raised. The dimensions of the metal are shown in the drawing. The metal top is fastened to the wooden base with screws and the holes for these screws should be considered in designing the top. They may even be made a part of the design with a raised portion left around their edges.

With carbon paper, trace the design in outline on to the metal. Paint in the design carefully with asphaltum, covering thoroly the parts to be left raised. In the square design shown all parts left white should be covered with asphaltum. The back should be painted also as all parts of the metal left exposed to the acid will be eaten by it. The asphaltum should be allowed to dry hard. The metal is then ready to be etched.

THE DISH STAND IN USE.

Nitric acid reduced one-half with water is best for this. If too strong the acid will eat away the asphaltum and attack the design. If weak the process will take more time than is desirable. A wire hook may be fashioned with which to lower the painted metal carefully into the dish containing the acid solution. process is plainly visible. Bubbles will form on the surface of the exposed parts of the metal. If the disturbance seems too violent the acid may be weakened by the addition of a small quantity of water.

No very definite time can be given for the period of immersion in the acid. It will take from two to ten



SUGGESTED DESIGNS FOR A BRASS HOT-DISH STAND.

This should also be used for raising it for closer examination as the acid will burn any fingers or clothing with which it comes in contact. Care should be taken not to breathe in the fumes which rise directly over the dish as they will irritate the delicate lining of the nose and throat. A sheet of glass may be placed over the dish thru which the process may be watched. The etching minutes to make the design visible, depending upon the kind of metal and the strength of the acid. The design need not be eaten too deeply. A very shallow depression, with the design barely indicated, is oftentimes enough.

When etched rinse off all acid with cold water. The asphaltum is easily removed with rags and gaso-

line, turpentine or kerosene.

The metal is now ready for the screw holes, the position of which should have been already indicated in the design. The screws should be countersunk so that the screwhead is level with the top surface of the metal. This top is screwed to a wooden base of oak or mahogany. Oak goes well with a brass top and mahogany with copper. There is a chance for variety in the shape of the bevelled edge of the base. This should flare out at the bottom. A piece of felt may be glued neatly on the under side or brass feet may be fastened to each corner as shown in the drawing.

The sunken parts of the design that has been etched in the top will gradually tarnish and grow darker while the raised parts will get brighter by being rubbed in use. This will improve its appearance and no further finish for the top is necessary. The wooden base may be simply rubbed with oil which will bring out the natural color of the wood. If the color combinations of oak with brass, or copper with mahogany, are carried out the natural colors of wood and metal together will be decorative and harmonious.

How to Print Your Christmas Cards Without Equipment

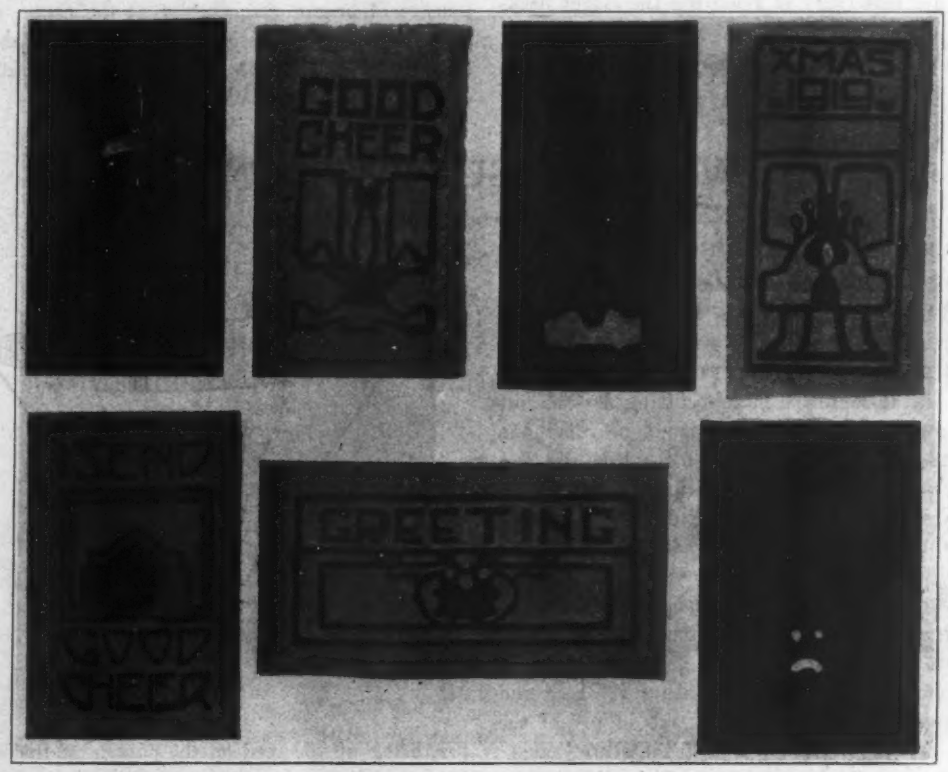
Hazel Willis, Associate Professor of Art, South Dakota State College, Brookings, South Dakota

THE following very simple process may be used in the home or in any school without the expense and bother of a press, inks, etc. The only materials needed are a piece of thick linoleum and a sharp-pointed knife, beside the regular equipment any art teacher has about the desk—such as tracing paper, pencils, ink and paste.

The first, last and most important thing is the design. In planning this, use a piece of charcoal or crayon, making broad, clear lines—anything finer would be difficult for a beginner to cut. Small masses not over a half inch are safe to use but not larger as they do not print clearly with only hand pressure. For subject matter use a symbolic or abstract idea as it lends itself to this primitive method of execution, with its coarse lines, more gracefully than a pictorial or realistic representation, where detail and fineness of finish are usually required.

After a satisfactory design is produced in spacing and center of interest, with dignified and readable lettering, trace on thin paper correcting all irregularities, squaring corners, and making as near perfect lines as possible with the aid of a ruler.

Draw each side of the charcoal making a double line pencil plan. Turn face down and ink the lines on the back with pen for clean cut edges and fill in between with a brush so that all parts you desire to print will



A FEW CARDS MADE AND COLORED BY THE AUTHOR'S CLASS.

stand out clearly. Next, using a mixture of paste and glue, rub it well into the linoleum and place the design inked side up so that the letters read backwards, taking care to make it smooth and let dry under weight to keep it from warping.

When thoroly dry, any sharp knife with a point may be used for cutting. Wind the blade with a strip of cloth to within half an inch of the point for ease in handling. Have about as much "push" as "pull" in your own hand or, in other words, cut against resistance of your own hand in order not to slip and cut across parts or mar them. Begin on a plain straight line by holding the knife so that the handle slants over the line and the point away from its base, giving it a wider foundation. Then slant the knife the other way, about an eighth of an inch outside of the first cut making a "V" shaped trench outside of the black line. Protect all black lines and spaces in this manner before removing the white background areas.

It is wiser to leave the letters till last when a little skill has been gained. Letters are most easily managed if a horizontal canal is first cut at the top and bottom of the word. Then the vertical rest between letters may be cut away and lastly the small details of background are removed by short stab-like cuts, taking care not to undermine a letter or break the standing parts by prying. If the cutting is done carefully the pieces lift out very easily. A small quarter-round gouge will aid materially in removing the larger background areas but care must be taken to work with resistance or the whole design may be ruined by one false slip.

To remove the tracing paper from the cut block, moisten the surface and rub off gently with the fingers so that no parts will be broken out. Do not scrape with a knife or the printing surface will be marred.

Use a small rug or piece of carpet covered with newspapers on the table for a surface on which to print. A creamy mixture of charcoal grey and water, or any other black water-color paint, will do very nicely for printing medium and is less dangerous to clothing than inks. Charge the block by holding in a horizontal position toward the light, using the side of an ordinary water-color brush. In this position the brush does not daub the background so easily and one may see whether all lines are wet. Make several proofs on ordinary wrapping paper, by placing the cut flatly without slipping. Press firmly with the palm of the hand and remove. Charge each time before making a proof. A few trial prints will get the block in good working order; the paint may be made the right consistency and a little skill will be gained in handling. For the finished work any soft-finish, unglazed paper may be used.

While the prints are drying, a simple envelop may be planned to fit the card or folder. Allow about an eighth of an inch on two sides of the card so that it will slip in easily when finished. The pattern should be planned very carefully with ruler and cut with scissors. Use as a form to draw around and tear the edges against a ruler, instead of cutting. Fold and paste. The prints may be made more attractive by touches of bright opaque color at the center of interest. It is well to limit the number of colors with a beginner, but the cards may be made as elaborate as one's experience with color will permit.

TWO GIFT SUGGESTIONS

Katherine H. Scott, Supervisor of Art, Mason City, Ia.

A CHRISTMAS SHOPPING BASKET.

WHEN snow flurries and zero weather prohibit the use of straw hats for head coverings and the hat of straw is packed away for another year, the garden hats are placed in store for a more befitting season, but may be purchased for a small amount provided one may impress upon the proprietor of the Five-and-Ten Cent-Store that you want these articles in quantity.

If you are successful in your purchase, soak your cheap hat in lukewarm water one-half to an hour or until the straw is soft. Remove from the water, press the crown into a flat, indented shape, pinch the edges of the rim together as in Fig. 1, fasten with clothespins and hang up to dry.

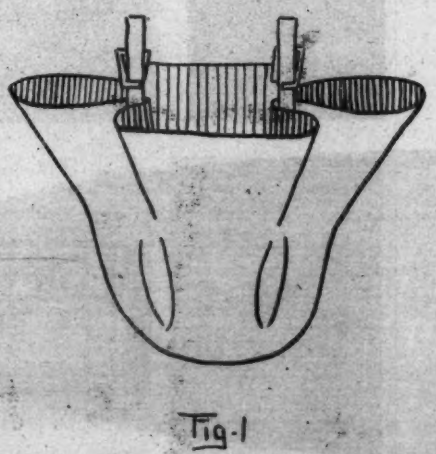


Fig. 1

Cut four pieces of No. 4 reed about 22" long and soak in water till soft. Insert two ends of two of the reeds thru a hole in the outside of the straw hat 1" from the edge of rim in the dent made by the clothespin, bring up the reed on the outside of the hat about 1½", and tie.

Carry both reeds to the other end on the same side of the rim and proceed as before; this makes one handle. Fix handle for the opposite side of basket in the same way. When handles are dry, wrap them with raffia.

Cut shapes from bright colored felts and arrange on one side of the basket. Fasten design on to the basket with bright colored beads, button-molds and fancy stitches with colored threads. Finish with a silk hand-made tassel suspended from the bottom of the basket and held in place, inside and out, with painted button-molds.

THE COMPLETED SHOPPING BAG.

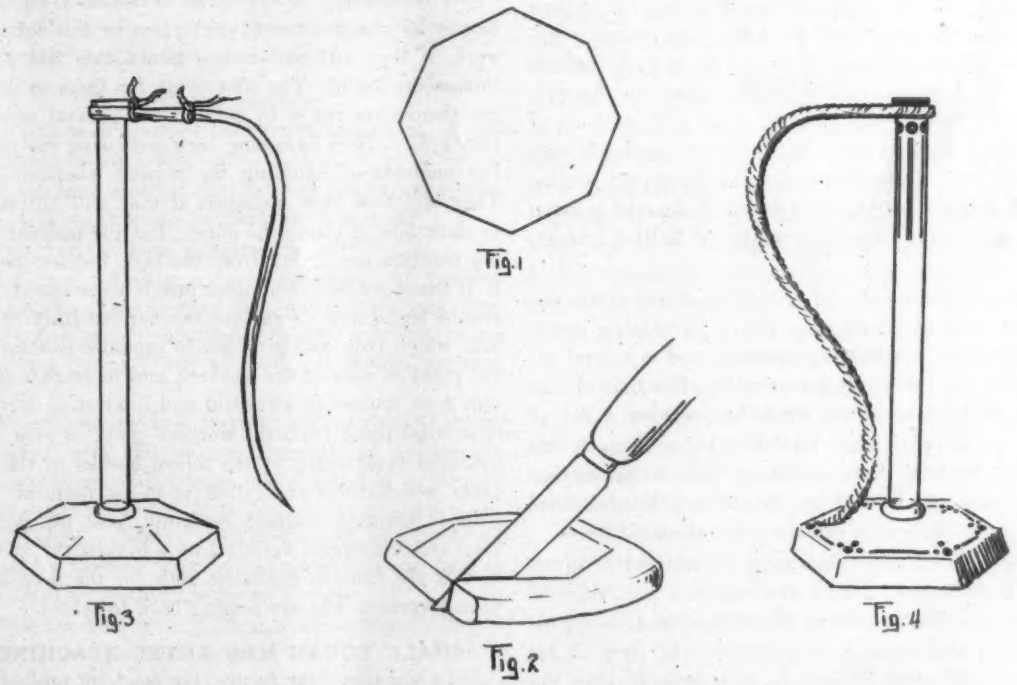
A BUD VASE.

An interesting and inexpensive problem for any seventh grade boy or girl is a bud vase made from an empty head bottle which may be bought at a Five-and-Ten-Cent-Store, a piece of No. 3 round reed, a few strands of natural colored raffia and a lump of permodello modeling clay.

Flatten out the clay to the thickness of about half an inch. Cut a paper shape similar to Fig. 1, and lay it on the clay pressing it slightly into the surface of the permodello. With a stencil or wood-block knife, cut around the edges of the paper shape using a slight bevel in the clay. While moist, press the end of the bottle into the center of the clay, rolling a smaller piece of clay to fasten bottle into an upright position.

Fig. 3. Cut a piece of reed about ten inches long, tapering one end to a point, the other splitting for about three inches from end. Soak the reed till soft, then wrap the split end around the neck of the bottle, tying it securely with a piece of string. Wrap the entire handle with raffia and insert the point of the reed into the moist clay, holding till it adheres.

When the permodello base is dry, decorate bottle and base with art-o-namel or enamelac as in Fig. 4.



DETAILS OF THE MAKING OF A BUD VASE.

INDUSTRIAL-ARTS MAGAZINE

E. J. LAKE S. J. VAUGHN
Editors

EDITORIAL

DOES THE SUPERVISOR SUPERVISE?

If conditions could ever be made favorable to efficient supervision in the manual, industrial, and vocational teaching, we should witness an immediate and radical improvement in the character of such teaching and in the quality of the work accomplished.

It is no reflection on the supervisors to say that their training in supervision has had to be acquired under the stress of getting the daily job done. They have for the most part been promoted out of classroom teaching jobs into the position of supervisor, and in their new position, they have had to deal with innumerable problems other than those of genuine supervision.

How many supervisors devote necessarily, a very large part of their time to such duties as the purchase of supplies, the distribution of materials and equipment among the various schools and teachers, the making out of requisitions, the examining of various and sundry reports, the settling of small points of friction, etc., etc.? How much time has the average supervisor to spend in actual contact with his teachers watching them teach and offering suggestions, pointing out places where improvements might be made, and generally encouraging them in their efforts to do a very difficult task well? How much time has the supervisor for preparing and testing out plans of work and methods of instruction? We fear that the time is so completely consumed in the infinite details and the unvarying routine that a hopelessly inadequate amount of thought is given to the vastly more important matter of skillful instruction.

The supervisor should not be expected to become a supply room clerk, an office boy, a purchasing agent, a truant officer, a telephone operator, and a general repair agent for the whole community. His finer duties are not fully done either when he prepares a list of models to be constructed and distributes them to his teachers. In fact, there is nothing quite so distressing to an ambitious teacher as to get a printed list of models to be made in a certain order at stated times.

The efficient supervisor must be relieved of much of the mere clerical work. His supreme task must be recognized as that of getting the highest possible degree of skill in the actual instruction on the part of his teachers. He must be an efficiency expert along the line of instruction. He must be a personal manager of wisdom and discretion. He must be a discriminating employment manager. He must be a leader and a co-worker. He must have the time to visit his teachers' classrooms frequently, coming into intimate and sympathetic contact with his teaching force.

Let's take a lot of the burdens off of the supervisor's shoulders and give him time to SUPERVISE.

THE MANUAL TRAINING TEACHER AND THE CONTINUATION WORK.

The great stress in education will come when the part-time provision of the Smith-Hughes Act has been put into effect in the various states that have adopted the compulsory part-time idea. There will be multitudes of boys and girls between the ages of 14 and 18 coming back to school from four to eight hours per week.

Some of the work which they will do will be trade extension work, some of it will be in the "related subjects", while a very great deal of it will be of the general continuation type. Under the latter heading will come, of course, classes in arithmetic, English, civics, shopwork, and other subjects that will continue the school work from the point where the pupils left school. But if the work in the continuation classes is given in the same old abstract and unrelated manner in which it was given before they left school, we need not expect the continuation scheme to be a great success. This work requires a new point of view. It requires instruction from those who are in a measure familiar with the kinds of employment in which the boys and girls are engaged, or at least with a sympathetic attitude toward young workers and their work.

The manual, or industrial teachers, are going to occupy a prominent and vital place in this scheme of work, if they will but study the situation and prepare themselves for it. The wise thing for them to do is to get themselves ready to help in the general continuation work. They have long been criticising the prevailing methods of handling the regular academic work. They will now have a chance, if they will but take it, to show how it should be done. Let the manual training teachers not shrink from the task, but let them see to it that they do not blunder into it unprepared. They should begin now to analyze the various lines of work into which boys and girls go, to organize courses from the point of view of the workers, and to prepare to present such courses in a skillful and interesting way. The most vital thing from the workers' point of view is the practical functioning of the school lessons in the daily tasks which they are called upon to perform. The manual training teachers certainly have the point of view and the sympathetic attitude toward the workers; now is the time to capitalize both for the good of the young workers who are coming back to school.

SHALL YOUNG MEN ENTER TEACHING?

In the very near future, the teaching profession is going to offer an attractive field for ambitious young men and women who are interested in rendering an unsurpassed service and at the same time in earning a

reasonable income. It is not worth while to claim for teaching the opportunities for fortune making, or the probabilities of large financial returns, as compared with some other fields of work. There are compensations, however, which tend to overbalance mere financial rewards, and we're going to witness a rapid return to ideals of service and reward not computed in dollars and cents.

The time seems near when the exceedingly high wage will cease to be offered for the unskilled and semi-skilled work of industry—when indeed even the better wage-earning occupations will have more applicants than jobs. The shift back to normal conditions will before very long leave the teacher a comparatively fortunate and well paid worker, if the increases are granted which have been promised and to which he is abundantly entitled.

The young men who finish high school and go to college are entitled to know the advantages, as well as the disadvantages, of the teaching profession. There should be an organized and thoroly presented program of enlightenment for the young people who leave our high schools. There is no reason why the preparation for teaching may not be made as good preparation for life as any other courses that may be taken in college or university. While we are giving vocational guidance, let's not neglect our own profession. The sordid phases of it have been pushed rather too much to the front. By the proper effort in the next few years, the teacher training institutions may witness a large enrollment of high grade young men and women to take the vacant places in the teaching ranks without doing violence at all to worthy and wholesome ambitions.

ART AND DESIGN.

IT HAS been asserted that art is not teachable, yet we presume to teach art.

It has been asserted that art and design are synonymous, and we presume to teach them as such

The truth of both assertions is conditional.

Art may not exist without expression of purpose thru design. Design may not qualify without that individuality which distinguishes art. Probably the best, if not the only way to teach art is thru projects in design.

We are passing that stage in art instruction which is satisfied with the infectious results of unbounded and unexplained enthusiasm. The artist is no longer a strange creature who lives in the upper atmosphere and performs wonderful things that do not apply to the lives of mortals, but he has come to earth and is very busy with setting the house in order.

This has been accomplished in the name of Design. Art may be taught thru design.

THE PROJECT.

THE MOST condemning evidence of weakness in our school instruction is the pupils' ignorance of a subject after the coveted "credit" is secured. "Oh, yes! I had that course, but I have forgotten all about it now," confesses the pupil. Teachers who attempt to find some understanding of a prerequisite subject on which to develop further instruction, meet with this acknowledged failure.

The graduate from each standard of our school organization condones his ignorance of a required course on the ground that it was not of his choice, and that he had no interest or talent in that particular subject. School courses must be balanced and arranged in order of sequence. The obligation of knowing a subject must be upheld. Taking studies without the obligation of acquiring definite knowledge of them is pernicious.

It is not possible for a pupil in our public schools to acquire a comprehensive understanding of any one of the numerous subjects taken. It is possible for a pupil to acquire *certain definite knowledge* of any one of the subjects taken, if the subjects are taught in a manner to impress that definite knowledge. Teachers of the Industrial Arts are confident that their methods of instruction give individual experience thru the project, which will make for definite, acquired knowledge. This project method is now emphasized as a necessary part of all school instruction.

A project is more than a question. A project performed involves experience with knowledge, and gives evidence of knowledge without which the project could not have been performed. The value of the project over the assigned lesson from a text lies very largely in the fact that knowledge is fixed in mind thru experience.

We have heard much of distinction between Information and Ability; Knowledge and Education. We have concluded that information which is retained only long enough to answer eight out of ten examination questions may be quite worthless. There is but one way to make information useful, and that is to make use of it thru the project. Learning by doing is the educational process that will remedy many of our school evils and ills.

CHRISTMAS.

INDUSTRY implies active service.

Art implies expression of pleasure thru beauty and propriety.

Industrial Art implies active service thru the expression of beauty and propriety.

Christmas is the Industrial Art worker's opportunity to give service thru the expression of beauty and propriety. A gift of service that gives pleasure thru beauty and propriety is only excelled in value by its reaction on the giver.

Let us give gifts of service, and we are certain to receive tenfold. We can all afford such gifts. We cannot afford to withhold service. A Merry Christmas will be our reward.

THE USE OF LACQUERS FOR WOOD FINISHING

Walter K. Schmidt, Grand Rapids, Mich.

History tells us, and clearly shows us after every strife, and during it, that many new things are evolved. Possibly this is due to the fact that "necessity" is the mother of invention." Certain it is that warfare is a great incentive to discovery.

During the late unpleasantness in the near East, shellac came to be prohibitive in price, and not only that, but stocks were none too plentiful. The inevitable result of such a condition became manifest in the numerous "substitute shellacs" offered upon the market. The great majority of these substitutes are properly classed by the prefix—"sub". That is about as far as they get. Few of them possess in any degree the excellent sealing qualities of pure shellac, and are often composed of nothing but a cheap gum cut in a suitable solvent.

During the years of peace there were practical finishers interested in producing something new, who got up creations in which they employed other than the usual materials. One of these articles was lacquer, borrowed from the brass or metal industries. But this never worked quite right, it was fairly good, but not what the finisher was striving for. He had the idea, but that was about all.

Today, however, conditions are greatly changed. The manufacturer of lacquer has heeded the call of the finisher, and now, after much research work, he can choose from a number of lacquers, to suit the work in hand. These modern day lacquers are not to be confused with the lacquer such as is used on brass or metal work. Wood lacquers are built along the finisher's ideas, being compounded from the excellent qualities of pyroxylin, and specially treated gums.

Wood lacquers produce a soft velvety finish that is rich and transparent. The finish also is waterproof—a big point in its favor—and resists wear to a remarkable degree. There is no trouble with gray pores when these lacquers are used, as they are especially built for wood, and wood only.

A lacquer finish may be rubbed dull and a little effort produces the even, satin finish that is a delight to the eye, and is bound to grow in popular favor as time goes on.

Lacquer also makes a big cut in the time required to finish, say, a chair. Let us assume that the piece is stained and filled, and that the surface has been made perfectly smooth. A coat of lacquer is now applied. Let it dry for a day. Now another coat of lacquer. Let dry another day, and then apply the usual finishing process. The result: We have a beautiful finish, soft and velvety; it seems a part of the wood. It is waterproof, turn the hose on it if you wish. It is tough, and resists wear to a remarkable degree. Lastly, it has enabled the manufacturer to speed up production with *safety*.

However, despite all the advantages in its favor, the adoption of lacquer as a complete finish by the manufacturer, must come slowly. It takes time to put anything new upon the market. The public must be educated, as well as the manufacturer of furniture. To become popular, and permanent, lacquer must have a normal healthy growth.

This means that many makers of furniture, while at present slow to adopt lacquer as a complete finish, are yet eager to seize upon it as a substitute for shellac. I touched upon this point at the beginning of this article. Shellac is high and scarce, substitute shellacs are articles of doubtful caliber. They may look good at first, and yet fall down grievously later on.

A good many of these so-called substitutes are composed of gums very similar to the gums used in making varnish, cut in suitable solvents. Let us assume we have a piece of wood which has been finished with a substitute, and then varnished in the usual manner. At first the work may appear to hold up well, but gradually, owing to the similarity of the gums used, the substitute shellac will absorb the oil from the varnish, which in turn is absorbed by the wood. The result is, the finish falls down.

Not so with lacquer. When a coat of this specially prepared wood lacquer is applied, it really does take the place of shellac and stops all absorption of oil by the wood. Its bridging, holding and binding qualities are well nigh perfect, and it holds up the succeeding coats of varnish so as to make a permanent and lasting finish, and in addition it is waterproof and very durable, on top of it all, wood lacquer does *not* raise the grain—shellac does.

The employment of lacquer in place of shellac opens a wide field, and one that is rapidly being developed. It is but a step to the adoption of lacquer as a complete finish.

Even now, however, lacquer is already being adopted as a complete finish in one line. I refer to the "open pore" finishes. There used to be quite a variety of these, mostly on oak: Belgian, Cathedral, Tobacco Brown, etc. Gradually these were supplanted by the "filled" finishes until today we have practically but one survivor, fumed oak. And even this is not made in really high grade furniture.

Lately, however, there seems to be a general desire for a return to open pore finishes. Just before the war a new shade known as "Sequoyah Oak" was introduced, but failed because of the war and its various complications. Now, however, it is slowly being revived.

Lacquer is the ideal finish for open pore work. It saves many operations, and gives just as durable a finish as was ever produced, with possibly even better protection to the wood. Just at present some very high grade open pore work is being turned out, but little is being said about it. These factories are not desirous of advertising their product too much, lest the remunerative field be encroached upon, but it is only a matter of time when the next grade of factories will "wise up" to this, and so on until open pore finishes are quite general.

So far we have made no mention of the best means for applying wood lacquers. This is a subject by itself, and in this article we can touch upon it only briefly.

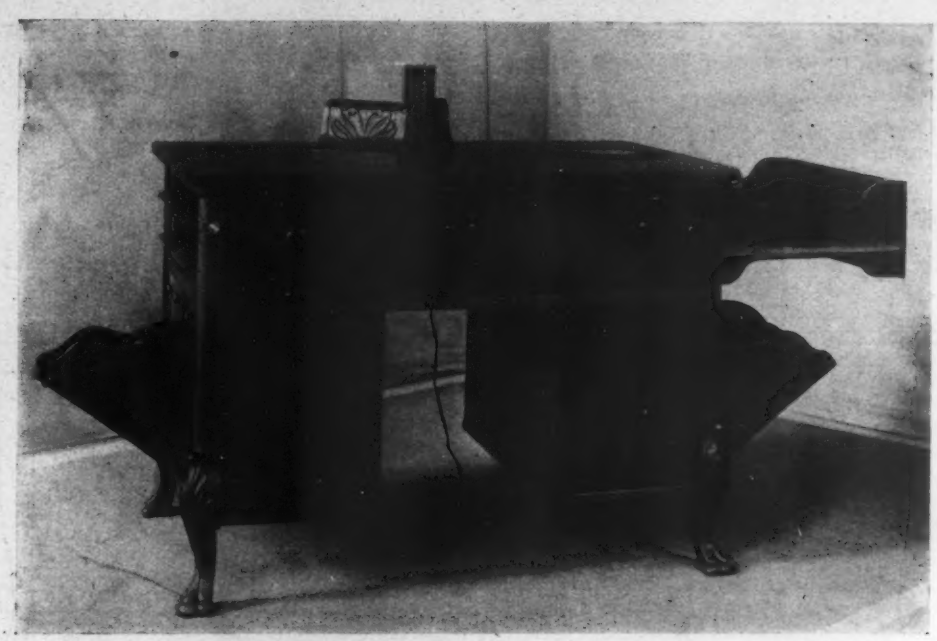
Suffice it to say that the spray, or air brush, is the only practical means for spreading the lacquer. However, on small pieces the dipping process may be used, or the brush will yield successful results if a little care is exercised. Very good results can be obtained with a brush on small articles if the following points are observed. Use a soft brush, one that *will not* shed its bristles, flow the lacquer on, brush it as little as possible, see that the lacquer is properly reduced. It needs more reducer when used this way.

Every college or industrial school should have an air brush, and the smaller schools would find it of value also, for the spray is daily coming into a broader field.

There are three essential parts to a spray, the air compressor, for obtaining the necessary pressure, the container for the liquid that is to be sprayed, and the "gun" for atomizing, and applying said liquid to the surface.

In small outfits the gun and container are built as a one-piece apparatus, and are connected by tubing to a device which regulates the pressure, and also drains the compressed air of dust and moisture.

As low a pressure should be used as possible, in order to prevent undue evaporation of the volatile solvents, and too hasty drying of the finish. In spraying a flat panel, the work should be started on the side nearest to the operator, and the brush then moved back and forth, until the opposite edge of the panel is reached. This will give a smooth even coat.



TALKING MACHINE MADE BY STUDENT IN AMSTERDAM VOCATIONAL SCHOOL.

SOME BOY FURNITURE

H. H. Todd, Vocational School, Amsterdam, N. Y.

The photographs and drawings on the present and following pages represent original work by boys in the Amsterdam Vocational School, Amsterdam, N. Y. They are the result of an endeavor to get away from the traditional straight line type of furniture produced in schools and are a compromise in design, decoration and finish between the ideal which has been set up for the school and the practical possibilities that were formally attained. The woodworking department of the Amsterdam Vocational School has always insisted that good or bad, all work must be done by the pupil and that every element of design and finish must be within the capability of the boy as well as suited to the article to be made.

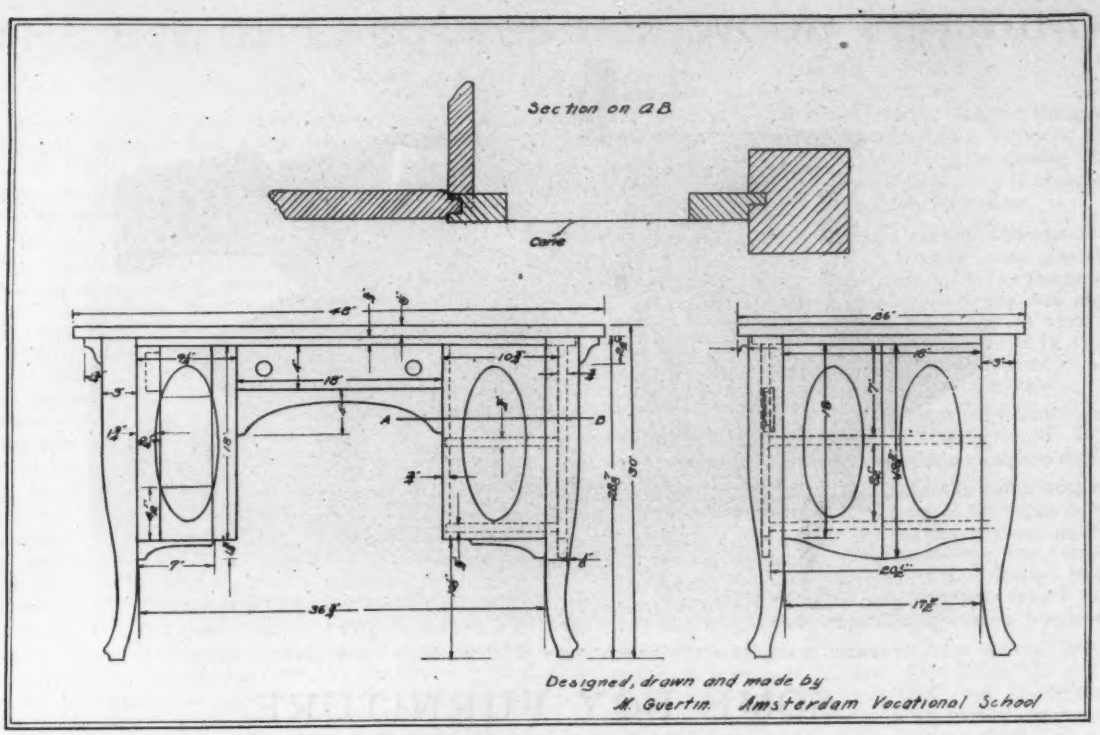
The lamp illustrated is a frank copy of a commercial article which the boy saw and admired. The shades are supported by a heavy copper cable, but is not at all good, in the opinion of the writer.

The table illustrated was developed from a simple straight line design. The table would perhaps be more attractive with a more pronounced taper, but the design as it stands represents the boy's own ideas. He was thirteen years of age when the table was made and had previously helped make a lot of six teachers' desks for school use. The two boys who helped in the construction were slightly younger and all three were in the sixth grade at the time.

When the table was nearing completion, the boy was encouraged to consider the possibility of a little carving to improve the appearance of the table. Since he had never used carving tools, the instructor suggested the

TABLE (SEE DRAWING NEXT PAGE).

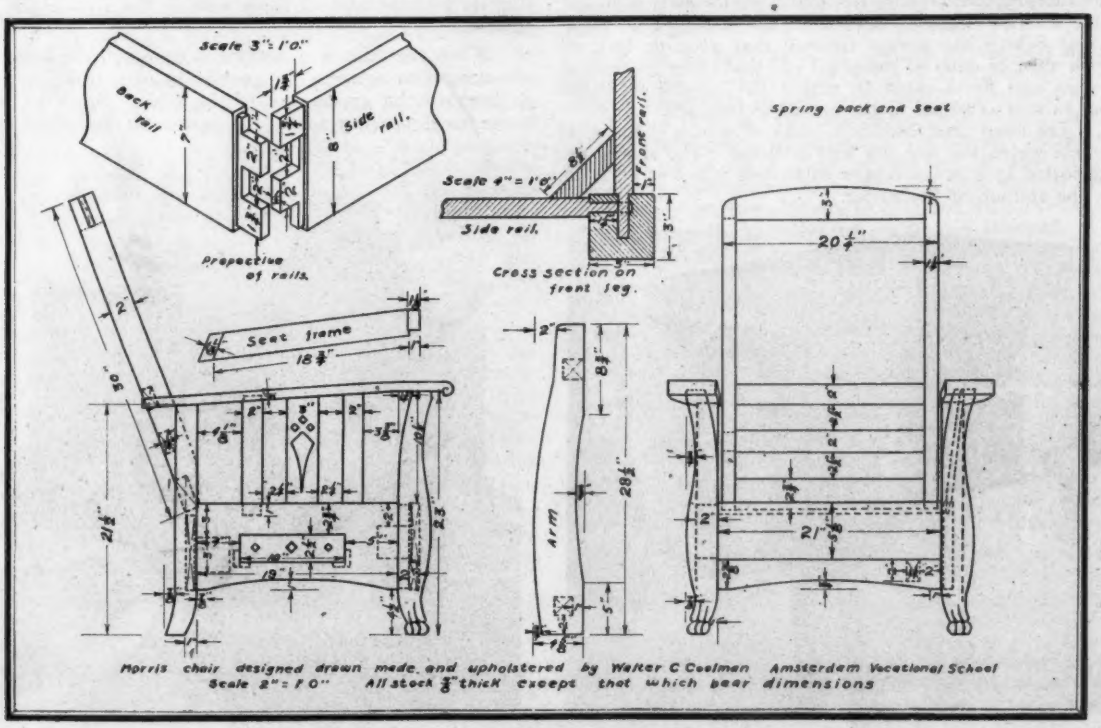
ANOTHER VIEW OF THE TALKING MACHINE CABINET.



STUDENT'S DRAWING FOR TABLE (SEE PRECEDING PAGE).

general character of the carving and to give the boy a practical demonstration concerning the work out of a design and the use of the tools. He actually made one of the carvings. The boy worked out the other seven. The top was set between the legs of the table, so that the little medallions would not be hidden by an ordinary overhang. The fitting of the top at the corners required very careful work. The part of the top which rested against the legs was made slightly hollow to insure a better joint.

The table which has caned panels is an outgrowth of the idea expressed in the other earlier table. It was suggested to the boy who made this table that he use the ellipse as the basis for all curves in the design. The idea was carried out thruout the work. The panels are hand


Scale 3"= 1'0"
Back rail
Side rail.
Perspective of rails
Scale 4"= 1'0"
Front rail.
Side rail.
Cross section on front leg.
Spring back and seat
Seat frame
Arm
Morris chair designed drawn made and upholstered by Walter C Coolman Amsterdam Vocational School
Scale 2"= 1'0" All stock ¾" thick except that which bear dimensions

STUDENT'S DRAWING FOR MORRIS CHAIR (SEE FOLLOWING PAGE).

LAMP AND TABLE DESIGNED AND MADE BY STUDENT OF AMSTERDAM VOCATIONAL SCHOOL.

caned but it was likely that if the design is used again, wood or tapestry will be used.

A boy of fifteen, who is a member of a special class, equivalent to first year high school, designed and made the table.

The phonograph cabinet was worked out by a lad of fifteen, who has an excellent mind for mechanics. The phonograph proper is mounted in an end drawer. It is motor driven and is started and stopped by a button switch. The open back of the drawer connects with the sound box on the opposite end. This sound box has a shuttered opening so arranged that some control of the sound is possible. The shutters, however, don't seem to work well in practice as the sound waves seem to carry thru the table itself. Hinged boxes for records are located below the body of the table proper.

The carvings were made with some assistance from the teacher. The latter carved one-half of one panel and the pupil completed the job.

The design of the cabinet is not absolutely original but was taken from a furniture catalog which contained a small illustration without dimensions or information concerning the construction. The boy developed the design from the picture and the drawing and the details are entirely original with him. The wood for the cabinet is scrap lumber taken from the lobby of an old hotel which had been torn down. The material was full of nails, dirt, varnish, etc., but was cleaned by the boy and when finished took an excellent polish.

The idea of the chair is an old one but was not directly copied by the boy from any single chair. The fittings for the adjustment of the back and of the leg rest were purchased by the boy from a furniture house. The design of the chair, the small drawers, the rack, etc., were all made part of the design by the boy. He did the entire work of making and upholstering the chair and of staining and varnishing the wood.

All of the pieces shown were made with no help on the part of the instructors, except as indicated. The boys received criticism at very important steps, but a careful effort was made to secure as much originality and as much initiative as possible.

CHARRING DOES NOT PRESERVE WOOD.

Charring is of little value in protecting the butts of fence posts and telephone poles from decay. This is shown by service tests made by the U. S. Forest Products Laboratory on fences of charred and untreated posts of various species. The charred posts proved in these tests to be even less durable than the untreated ones.

Theoretically, an area of charred wood around a post should prevent decay, because charcoal does not decay or

THE COMPLETED MORRIS CHAIR.

encourage the growth of fungi. But the charred area around a post is not usually a solid covering. It is checked thru in many places. If posts are seasoned before they are charred, the charring does not reach to the bottom of the season checks which are always present. If green unchecked posts are charred, checks will open thru the charred parts as the wood seasons. In either case the uncharred center of the post is exposed to fungus infection and will decay as rapidly as any untreated wood.

Charring deep enough to resist decay would undoubtedly weaken a post of ordinary size.

THE VALUE OF ART TEACHING IN PUBLIC SCHOOLS.

A Statement by Dr. James P. Haney, Director of Art in the High Schools of New York City.

The art training of the elementary and high schools should be a practical training touching closely the needs of the community; it should aim to cultivate taste and apply that taste, when cultivated, to the homes, the dress and the business of those it trains.

A very mistaken idea is to hold that art is the business only of the artist. As a matter of fact, the principles of art touch every individual and are used more or less consciously by all. The house-wife has to decorate her home. She may use the principles of decoration well or ill, but use them she must, in the adornment of her house, in her dress, and even in the flowers which she plants in her garden or hangs in her window boxes.

The business man cannot escape from the use of art's principles for a single day. If he would "dress" a shop window, get up a circular, design a letterhead, or arrange a newspaper advertisement, he must consciously or unconsciously use the rules which art has devised in design, color and arrangement.

Art, in other words, is not for "the few," it is for "the many," for the many have to use it. It is not held that the training of the elementary and high schools will produce artists, but it is held that it will raise the standards of taste thruout the community. Higher standards of taste mean advances along many lines. We cannot have people with such standards without an effect on trade. People who know better things, demand better things. Thus the art teaching of the schools has a practical relation to the business interests of every community.

Besides this, there is a civic value in art teaching. One cannot raise standards of taste without raising standards of appreciation. The man or woman who strives to make his house better takes pride in having his town made better. Every civic "booster" knows that there is nothing which stimulates the interest and pride of citizens more than a consciousness of the growing beauty of the town in which they live.

Thus the spiritual value of art training goes with its practical value. Many of those who cannot see the spiritual worth can see the practical worth. One of the surest evidences of the broadening realization of this lies in the fact that every progressive community thruout the union is using art training in its schools as a means of advancing community interests. The reason is plain. One cannot change, materially, the taste of a people already grown up. To effect these standards, permanently, one must begin with the children in the public schools. This accounts for the enormous spread of art education thruout the union. Art teaching is not a fad, it is an economic question with an economic reward to every community that realizes this and forwards the art work of its schools.

Printing Class Reproduces Declaration of Independence. The print shop of the Wm. L. Dickinson High School, Jersey City, N. J., has recently reproduced the Declaration of Independence in a very suitable manner for framing and for hanging in the classrooms of the city. The document is reproduced in a sheet of high-grade stock 15x20 inches in size and the initial letter is hand-colored.

A Course in Management Education. Dr. Hollis Godfrey, President of the Drexel Institute, Philadelphia, is authority for the statement that a majority of the colleges in the United States will provide courses in industrial management. The aim is to study national problems in order that the colleges may render the greatest possible service to industry. The movement is the outcome of a conference between the college authorities and the leading manufacturers of the country.

SOME EXAMPLES OF APPLIED ART IN THE SANTA BARBARA NORMAL SCHOOL.
The bags illustrated are examples of work in design and needlework by students of Miss Malcolm Huff, instructor in design.

PROBLEMS AND PROJECTS

The Department of Problems and Projects aims to present each month a wide variety of class and shop projects in the Industrial Arts. Successful problems are invited and will be paid for. A brief description of constructed problems, not exceeding 250 words in length, should be accompanied by a good working drawing. The originals of the problems in drawing and design should be sent.

Problems in benchwork, machine shop practice, turning, patternmaking, sewing, millinery, forging, cooking, jewelry, bookbinding, basketry, pottery, leather work, cement work, foundry work, and other lines of industrial-arts work are desired for consideration. The editors will not accept the old hackneyed problems of footstools, taborets, towel holders, etc., which have been made from time immemorial, ad nauseum.

Drawings and manuscripts should be addressed: The Editors, INDUSTRIAL-ARTS MAGAZINE, Milwaukee, Wis.

A WINDOW REFRIGERATOR.

Mr. Chelsea L. Bailey, Cincinnati, O.

The following design of a window refrigerator, or box has proved very popular with the boys and the community in which the writers' school is located. It is a project that can be made by the ordinary 14-year-old boy and is so designed that he can do a good piece of work.

This particular size of refrigerator in the Cincinnati stores sells for $5.50, but can be made by a boy at the cost of material, approximately $1.75. If 30″ sheets are used there is very little waste.

Perhaps the drawing needs some explanation.

The sides are gotten out first as per pattern, the hole being punched with a one-inch hollow punch. Next come the front and back which are double seamed to the sides; if a good narrow seam is obtained no solder is needed, altho three tacks at each corner will strengthen it immensely.

We now make four screen holders as shown by pattern with a 1½″ hole punched in same. Small screening is folded in these and one is soldered over each hole in the sides.

The bottom is doubled seamed to the body next and tacked if necessary. Holes are punched at "a" and opposite side and covered with screen as before.

Now we take two pieces of one-inch band iron, 28 inches long and drill or punch holes (one-quarter inch) as the pattern shows. The ends are next bent at right angles and fastened with stove bolts at "x" and "y", a piece of 22 gauge iron is riveted at "z" and this frame supports the removable shelves. Two shelves are used instead of one for the reason that it is much easier to get them out. The same applies to the false bottom.

The door is next cut out and hemmed as shown and fastened to the front by means of three two-inch butt hinges. It is well to place a piece of band inside and out of front to stiffen the place where the hinges are fastened. This also makes for better closing the door. A cup catch may be purchased for fastening the door when closed.

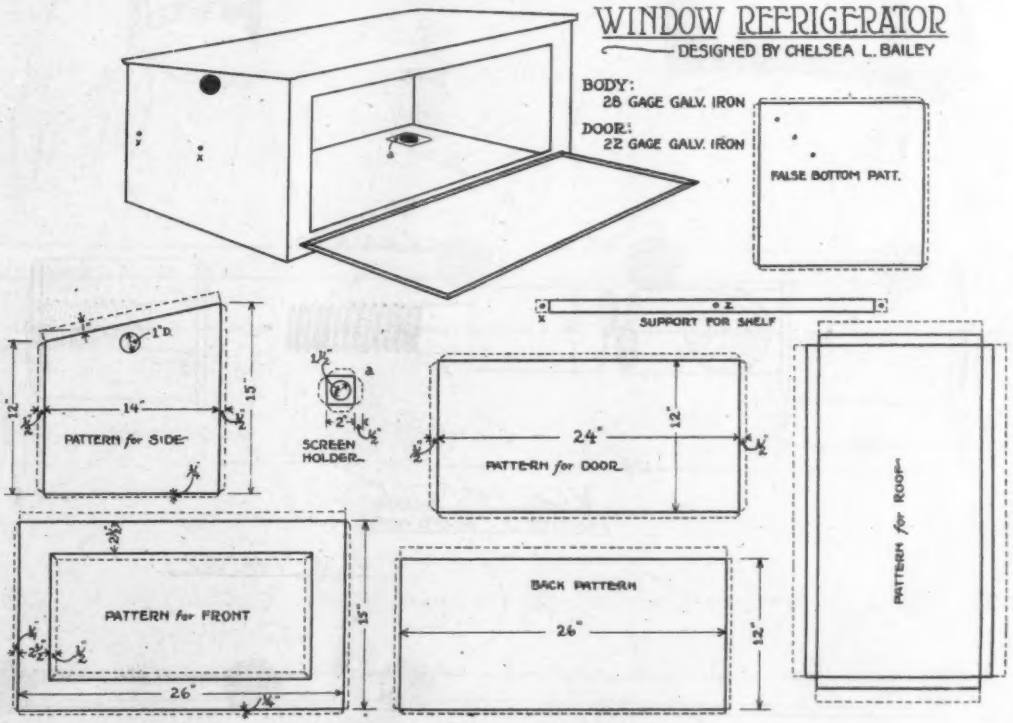
The roof is placed on last and corner pieces are soldered in. This makes a much better corner than points.

The refrigerator can easily be fastened by screws to the window sill, and guyed with a plumbers' safety chain or wire to the casing.

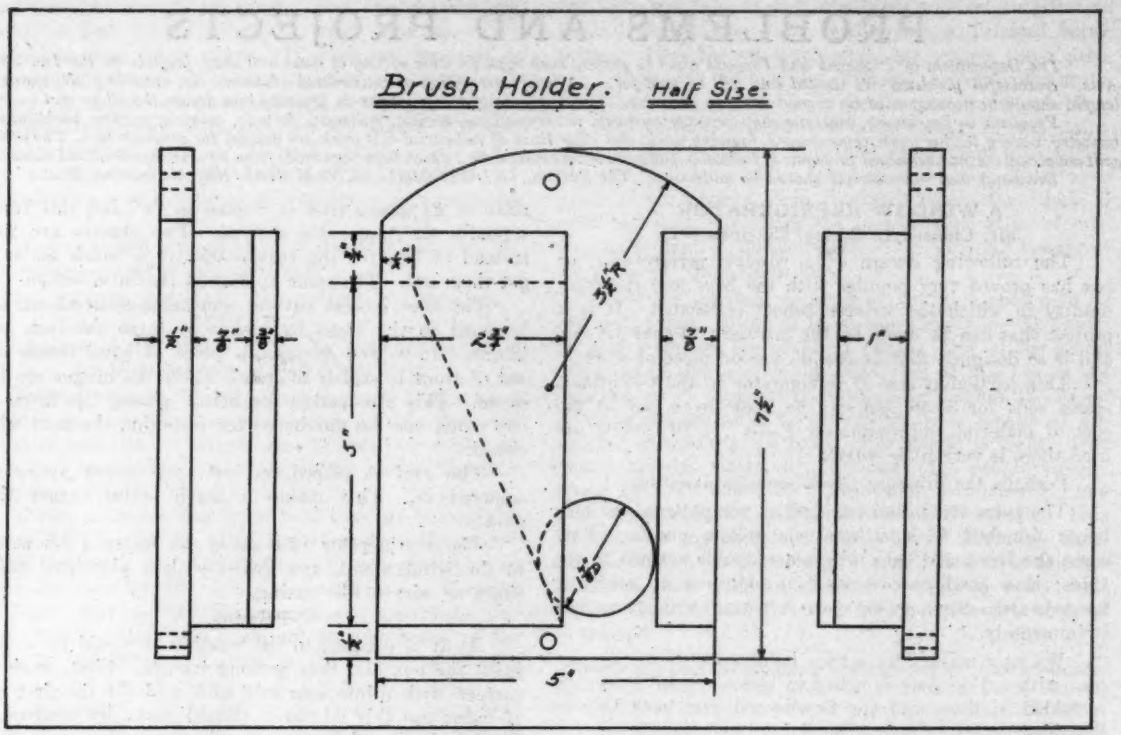
Painting.

As it is exposed to the weather it would be well to paint the box and thus prolong its life. First, wash the surface with dilute muriatic acid, and for the first coat of paint use this mixture: Equal parts, by measure, of dry red lead and first class mineral brown, ground together dry and then mixed by hand with equal parts of pure raw linseed oil, and pure spirits of turpentine.

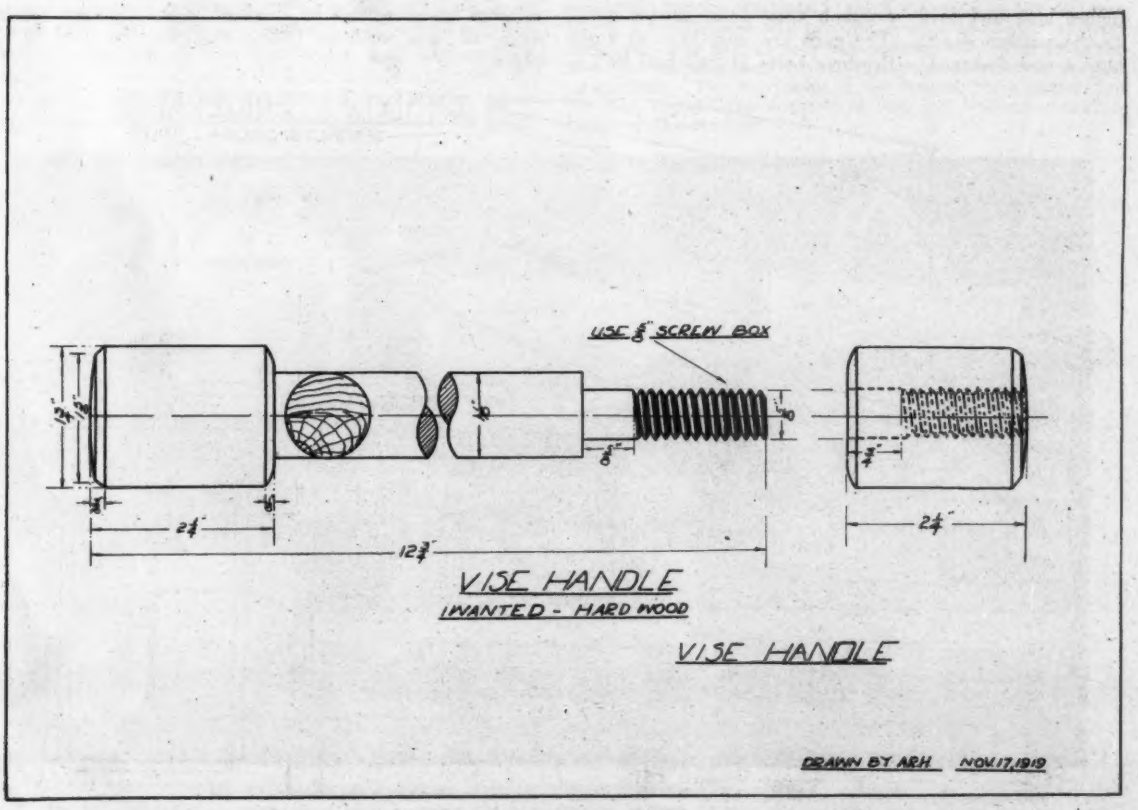
Over this priming any good oil paint may be applied and permanent adhesion looked for. If a good grade of mineral brown cannot be obtained, a fine chemically-pure oxide of iron, such as Indian red, may be used in its place.



DETAILS OF WINDOW REFRIGERATOR.



DETAILS OF BRUSH HOLDER.



DETAILS OF VISE HANDLE.

HANDLE FOR VISE.

Alfred J. Bate, Saunders Trade School, Yonkers, N. Y.

This problem is of practical value for the variety of operations in turning which it involves. It was first made in replacing broken handles on vises in the Saunder's shops.

Maple or any other hard wood may be used. The piece which unscrews is stained to readily distinguish it from the solid end and the whole is finished with a coat of shellac.

BRUSH OR BROOM HOLDER.

Kenneth L. McCullough, Plainfield, N. J.

Each year there is a number of requests for broom holders and this model meets the needs more satisfactorily than the type so commonly used. While it may be given as a class problem, it is better suited for individual work. Odds and ends of any material may be used and finished with either stain or paint as desired.

WOODEN TOY ANIMALS.

Bertha Morey, Ottumwa, Ia.

The outline of the animal is first traced on the thin wood then carefully sandpapered to remove all roughness. The cut out animal is then tacked or glued to the base which is about three inches wide and one-half inch thick. The little wheels may be thin sections of broom handle, cross-cuts from wooden spools or wooden button moulds, tacked to the sides of the base as shown in the illustration. A screw eyelet may be used for the cord pull.

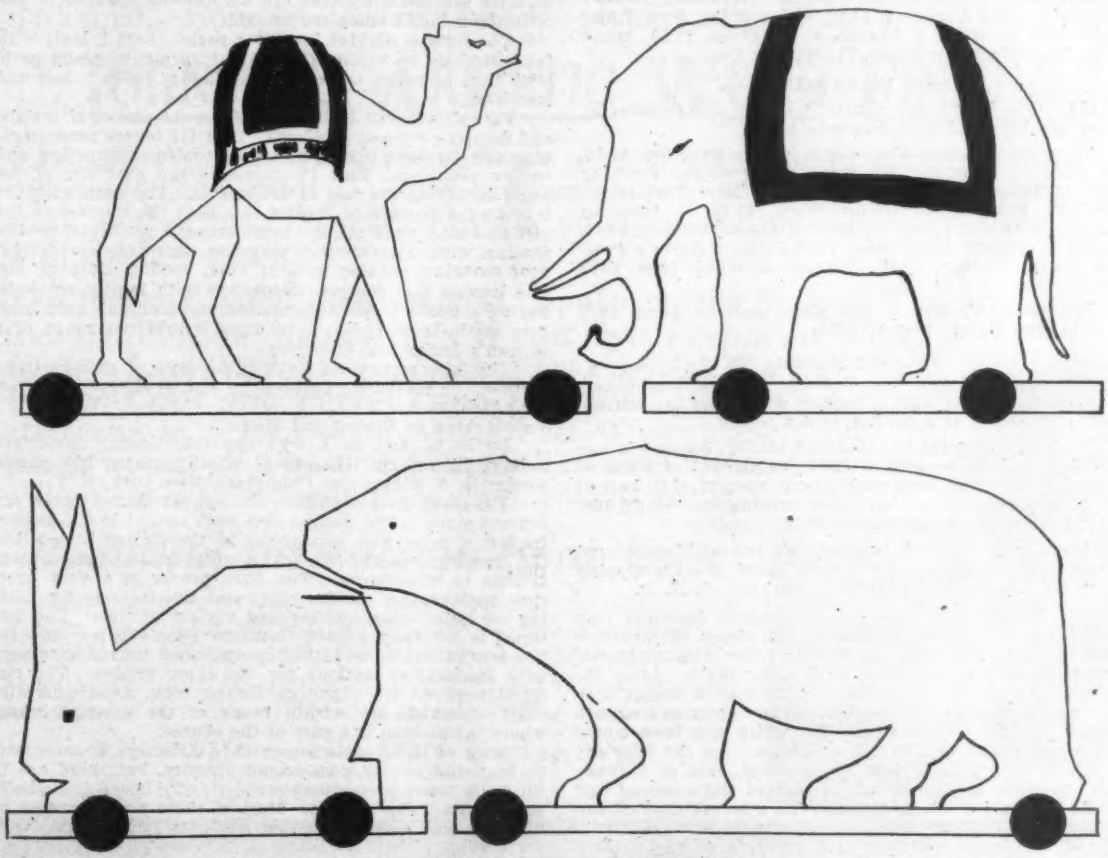
Two or three coats of paint will be needed to give a satisfactory color. The camel should be a light brown color with a gay blanket. The elephant may have even a gayer blanket to go with his dark gray hide. The polar bear must of course be snowy white. The rabbit may be of brownish gray or white. The wooden bases may all be black, with some bright colored wheels, or they may suggest the color of the earth's surface that each animal in life travels upon as sand color for the camel, tropical green for the elephant, icy white for the bear and grass green for the rabbit.

Mr. Wilson H. Henderson has been appointed Educational Advisor to the Hawaiian Territorial Government and sailed on September 1st for Honolulu. Mr. Henderson was until June 1st, Major in the Sanitary Corps and was stationed at the United States General Hospital No. 2, Fort McHenry. Following his resignation from the army he was for a brief period Vocational Advisor in the Army Vocational School at Camp Grant.

Mr. Geo. Oberteuffer has become Chief Instructor in the Wisconsin State School of Art, Milwaukee, Wis. Mr. Oberteuffer was for ten years a teacher in the Art Academy at Paris and has exhibited his paintings in the French Academy and at various important exhibitions in London, Paris, Florence and Rome. In becoming Chief Instructor in Drawing and Painting at the Wisconsin School of Art he adds another link to the strong faculty which Director Alexander Mueller has gathered at this institution.

Mr. Chester A. Scott, formerly head of the Manual Training Department in the Fort Wayne, Ind., High School, has been elected Supervisor of all Manual Training and Domestic Science work in the Fort Wayne schools. Among the new teachers who have been added to the staff of the department are Mr. Chas. O. Mays, in charge of 9th and 10th year Manual Training; Mr. C. B. Carpenter in charge of the Hamilton School; and Mr. A. W. Herdrich in charge of the Jefferson Junior High School.

Mr. J. J. Ritter, director of Vocational Education at Fort Wayne, Ind., has resigned to enter commercial work.



MINIATURES OF WOODEN TOY ANIMALS.

Now, Are There Any Questions?

This department is intended for the convenience of subscribers who may have problems which trouble them. The editors will reply to questions, which they feel they can answer, and to other questions they will obtain replies from persons who are competent to answer. Letters must invariably be signed with full name of inquirer. If an answer is desired by mail, a stamped envelope should be enclosed. Address, Industrial-Arts Magazine, Milwaukee, Wis.

A Fixatif for Crayon.

123. Q:—Do you publish a formula for a fixatif that will fix lecture crayon?—*R. P.*

A:—The following formulae are successful for the purpose:

1. Shellac, 40 parts by weight; sandarac, 20 parts by weight; spirit of wine, 940 parts by weight.

2. Dissolve 40 parts of alum and 20 parts of isinglass in 2,000 parts of rain water by boiling; strain the mixture thru linen, and add to it about 250 parts of alcohol. The paper may be dipped in the liquid, or the latter can be poured over it or applied with an atomizer.

3. Cut up some gutta-percha and dissolve it in a large bulk of ether in a closed bottle stood in a vessel of hot water. Pour off the fluid from the dregs and apply the clear liquid to the drawing or surface to be preserved. Lay it on lightly with a flat varnish brush or atomizer.

4. The simplest form of fixatif is white shellac, dissolved in alcohol and applied with an atomizer. Collodion has been used for the purpose.

Launch Construction.

128. Q:—Have you any book or plans on launch construction?—*F. M. S.*

A:—The following books will be found helpful:

How to Build a Cruising Launch, $1, Power Boating, Cleveland, O.; *Kunhardt's Yacht and Steam Launches*, $3, Power Boating, Cleveland; *How to Build a Speed Launch*, $1, Power Boating, Cleveland; *Model Boats, Sailing and Steam Vessels*, $0.50, Power Boating, Cleveland; *Grain's Gas Engines and Launches*, $1.25, Munn & Co., New York; *Davis' How to Build a Launch From Plans*, $1.50, Munn & Co.; *Russell's Motor Boats*, $1, Munn & Co.

Picture Frame Making.

129. Q:—Where can I get books, or other material, on the making of picture frames?—*M. S.*

A:—*Ford's Picture Frame and Picture Framing*, $1.25, J. S. Ford, Chicago, Ill.; *Hasluck's Mounting and Framing Pictures*, $0.50, Funk & Wagnalls Co., New York City; *Hessling's Frames and Gilded Work*, $5.40, B. Hessling Co., New York City; *Lukin's Picture Frame Making*, $0.40, Charles Scribner's Sons, New York City; *Noverre's Practical Frame Making*, $0.50, Tennant & Ward, New York City.

See, also, the files of the Magazine, for April, 1918 (p. 161), and March, 1920 (p. 128).

Finishing Walnut.

124. Q:—Will you please advise how we may obtain a good dark color on walnut lumber, which was sawed from small stuff and is of a reddish brown color?

We bought several hundred feet locally, because it was light in color and because of the large amount of waste at a very low price. Having such a large amount of it we will use it in cabinetmaking including turning and would like to turn it out with the richest finish possible.

Above lumber is still in the rough and will be surfaced in our shop. I say this for I have heard of mills dipping the rough boards in a solution to darken.—*C. H. D.*

A:—Walnut such as the correspondent describes may be finished as follows: Make up the pieces of furniture complete and then stain to desired color with Universal Brown water stain or other good water stain. After the stain has dried give the pieces a sizing coat of orange shellac reduced one-half with alcohol. Sand lightly to a smooth surface and fill with a silex filler which has been tinted with burnt umber and Van Dyke Brown. Let the filler dry 24 hours, then give a well brushed out coat of varnish. This should be sanded smooth when hard and a second coat should be applied. A third and even a fourth coat of varnish may be applied. The last two should be rubbed with feltpad, pumice stone, flour and water to a true surface. Clean up with clear water and give a good polish.—*R. G. W.*

NEW BOOKS

Elementary Machine Shop Practice.

By T. J. Palmateer. Cloth, 123 pages, illustrated. The Manual Arts Press, Peoria, Ill.

This book has been developed as the result of successful teaching and of wide observation of the work done in typical school shops. It outlines a series of problems which are readily within the ability of boys in high schools and technical schools and within the time allotted for shop practice. The information concerning machines, processes, tools and materials is simple and compact and sufficiently complete to give working knowledge for the beginner.

While the book was first issued in 1918, it has been completely revised and some valuable material has been added.

The publishers have produced the book with their usual care and excellence in illustrations, typography and binding.

Elementary Forge Practice.

Robert H. Harcourt. Cloth, 12mo., 154 pages. The Manual Arts Press, Peoria, Ill.

This volume is an enlarged edition of a book published by the author in 1917. Its successful use in a large number of school shops has led to its revision and reissue.

It follows the familiar plan of combining the fundamental information on forging,—tools, materials and processes—with a series of practical problems. The work is carefully graded; the explanations are specific and clear; the illustrations are exceptionally well done. The book is excellent for the general high school and for the technical school where the introductory forge practice is separate from the advanced vocational work.

Vocational Arithmetic for Girls.

By Nettie Stewart Davis, Academic Department, Milwaukee Public School of Trades for Girls. 137 pages, cloth bound. The Bruce Publishing Company, Milwaukee, Wisconsin.

The author has here embodied her experience as a trade school teacher into a practical textbook. She had for several years employed a series of lessons prepared by herself which were correlated to the vocational studies engaged in by the girl students. These were so thoroughly tested as to their serviceability that the author was induced to amplify them into a complete volume.

The book is divided into four parts. Part I deals with fundamentals in arithmetic, cost of garments, trade problems such as relate to tucking, hemming, ruffling, belt and smocking.

Part II treats of decimal fractions, the cost of materials, and domestic science problems. Part III covers percentage, bias and straight bands, pleating problems, carpeting and review problems. Part IV goes into the problems of the home involving the use of arithmetic. The author brings into play a number of studies that hold the interest of the girl student. Here are the home maker's problems, studies dealing with upholstering, papering, painting, varnishing, floor covering, sodding, cement work, roofing, clothing, etc. The lessons also concern themselves with family accounts, buying a home, postal information, banking and such business methods most likely to come within the range of a woman's duties and activities.

The book commends itself to teachers of girls in trade schools. It serves its purpose in a most direct and practical fashion.

Toy-Making in School and Home.

By R. K. and M. I. Polkinghorne, County Secondary School, Streatham, (London). Cloth, octavo, 299 pages. Frederick A. Stokes Co., Publishers, New York, N. Y.

Toy-making is rightfully taking an increasingly important place in the manual arts work taught in the grades. In fact it is so well established in the United States that the argument made for it in the introduction to the present volume is superfluous. The book proper is a very practical presentation of directions and illustrations for making an astonishing number and variety of toys. The material is carefully graded from the simple paper toys for the second grade to rather complicated tin-and-wire toys with mechanical motions for the upper grades. The material required are paper, cardboard, cork, wood, and wire—all of which are within reach of the average school where toy-making is a part of the course.

Most of the models shown have American counterparts to be found in our own school practice, but there are in the book many pieces that are decidedly novel and wholly new to American schools. Most of these are suggested by historic and local conditions and are most helpful for correlation with the reading of folk tales, history, etc.

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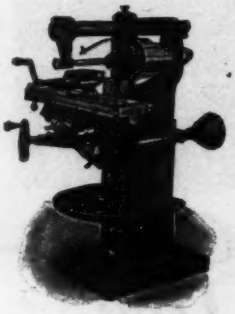

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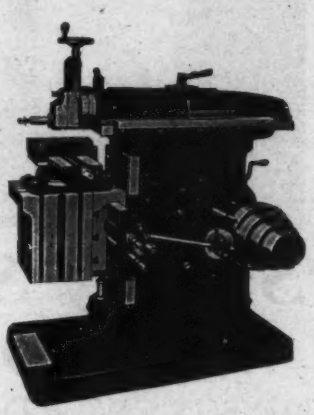

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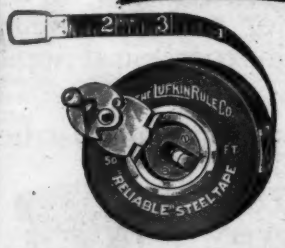

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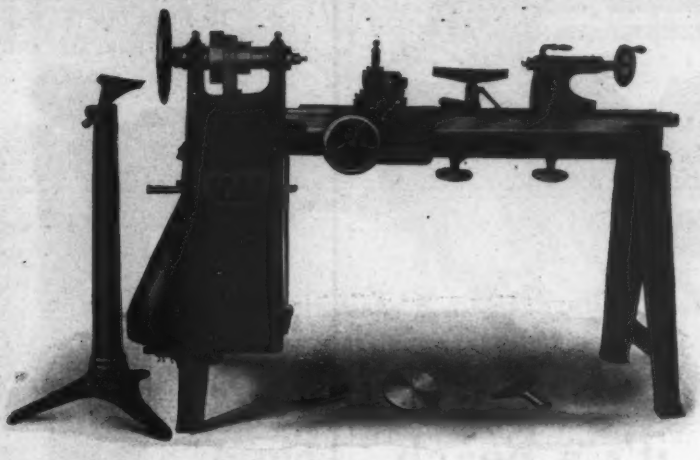

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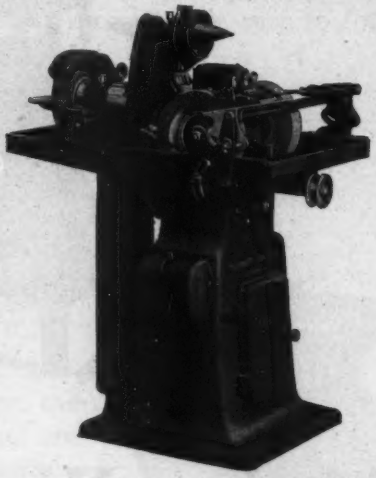

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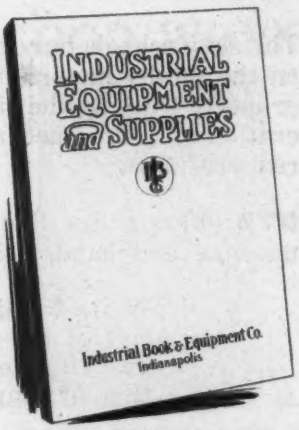

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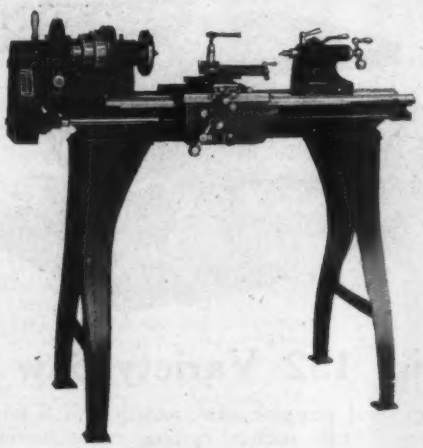

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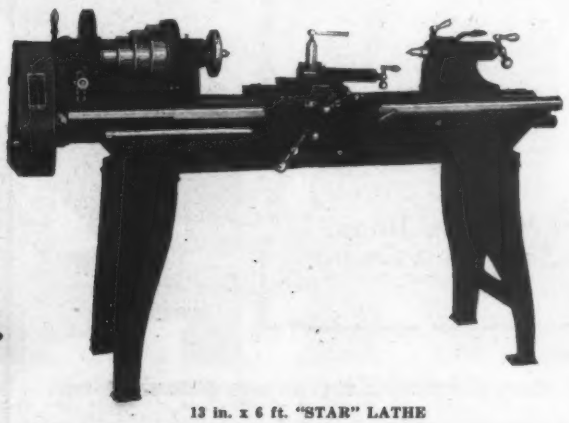

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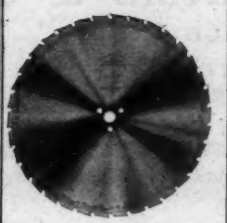

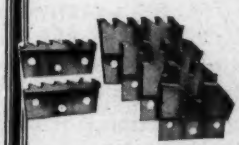

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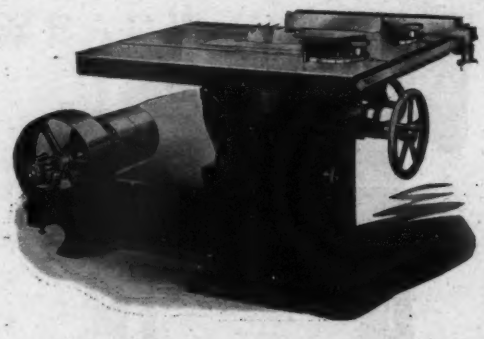

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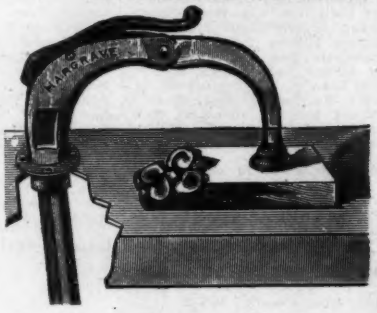

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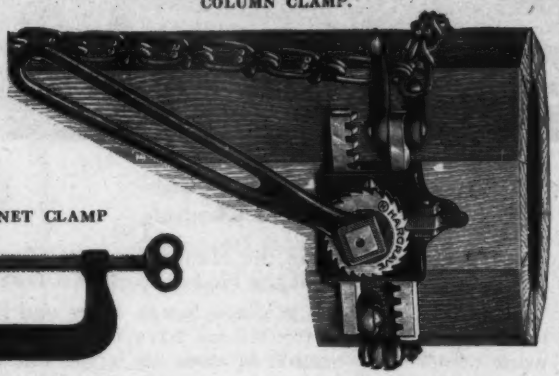

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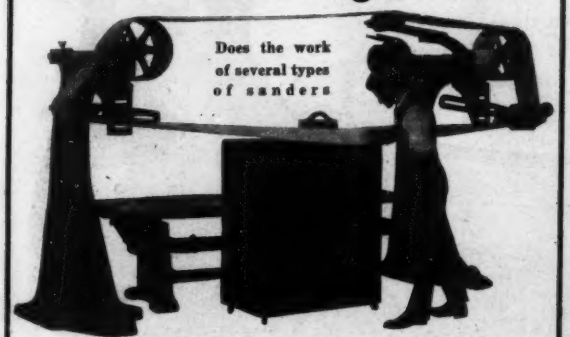

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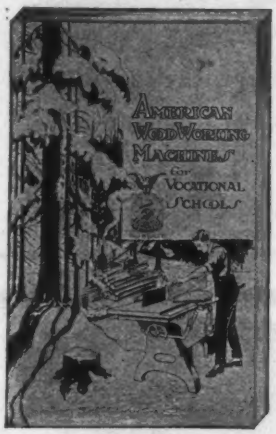

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PART TWO — A series of Illustrations on how to operate woodworking machines.

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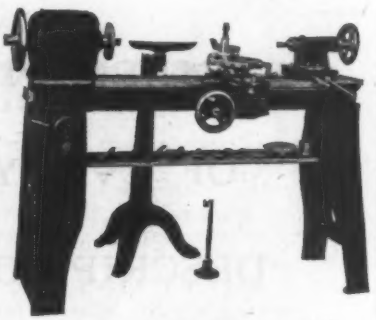

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(A. C. motor headblock)

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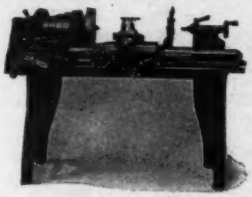
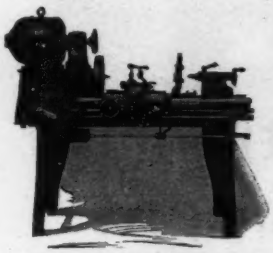
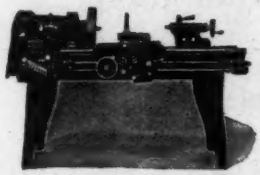


12"x5' Quick Change Gear Lathe



12"x5' Quick Change Gear Motor Driven Lathe



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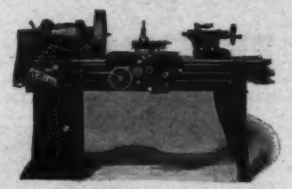
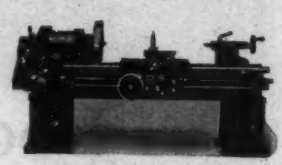


16"x6' Quick Change Gear Lathe



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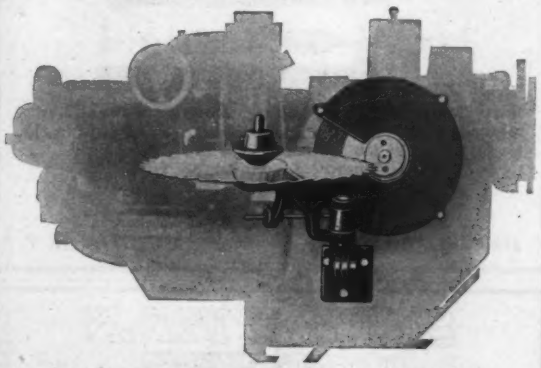

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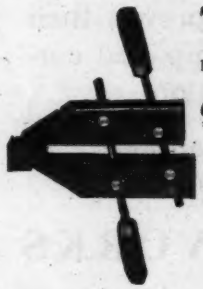

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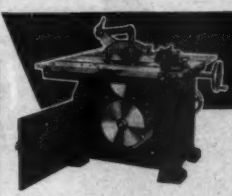

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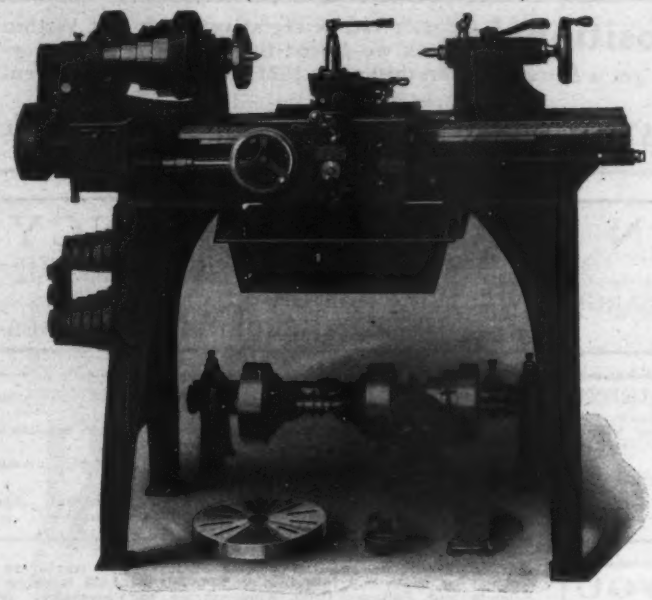

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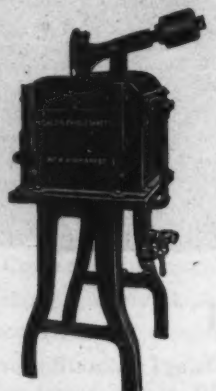

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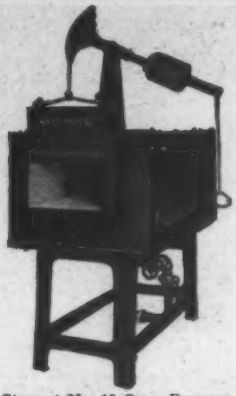

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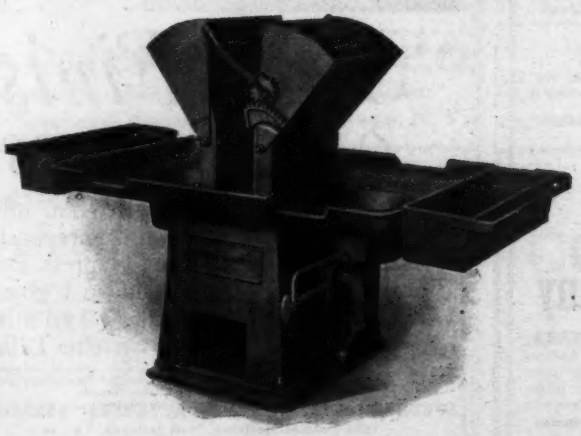

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INDUSTRIAL-ARTS MAGAZINE

Incorporating: HANDICRAFT and the ARTS AND CRAFTS MAGAZINE

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EDITORIAL CONTRIBUTIONS

The Board of Editors invites contributions of all kinds bearing upon the Industrial-Arts Education, Manual Training, Art Instruction, Domestic Science, and related subjects. Unless otherwise arranged for, manuscripts, drawings, projects, news articles, etc., should be sent to the Publication Office in Milwaukee, where proper disposition will be made. The Board of Editors meets each month, and all contributions submitted are given careful attention. Contributions when accepted are paid for at regular space rates. In all cases manuscripts should be accompanied by full return postage.

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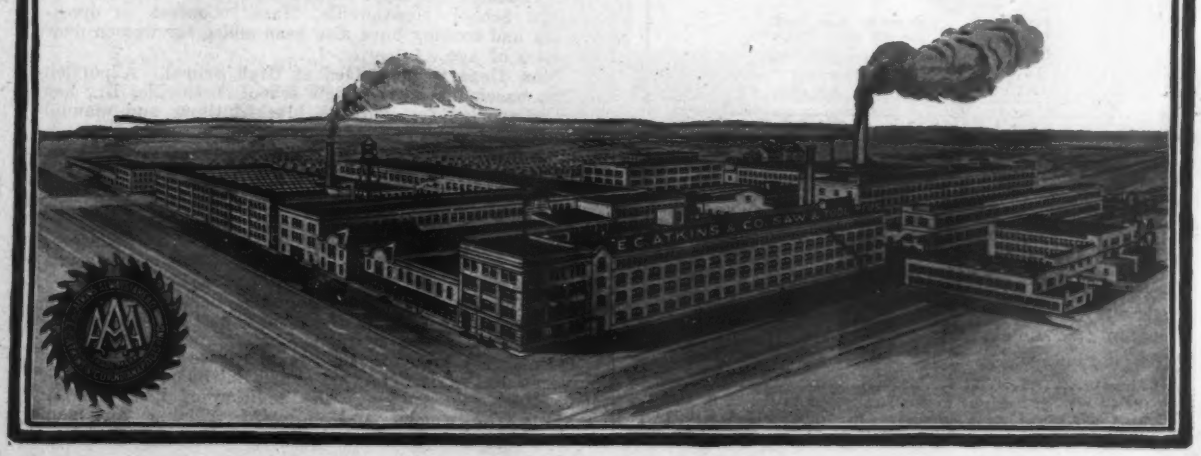

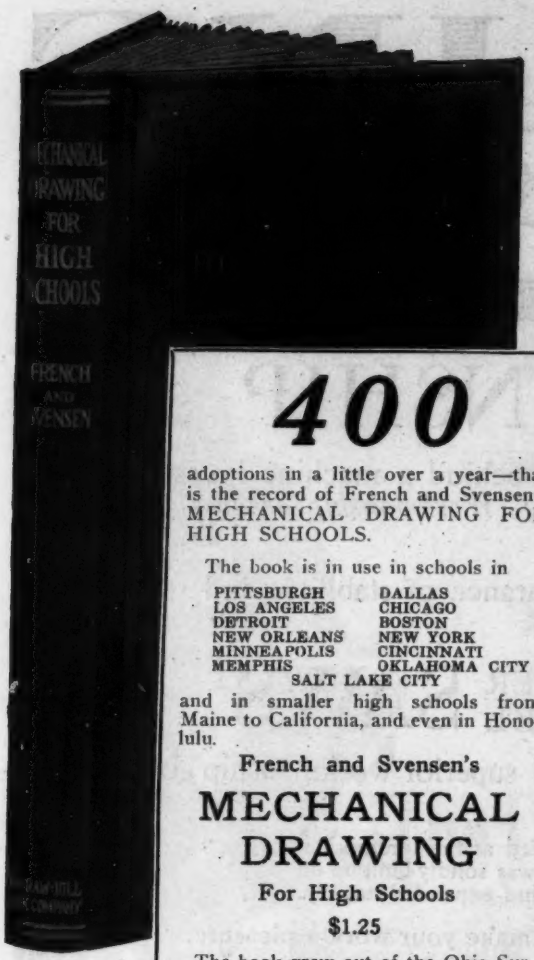

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PROGRESS IN VOCATIONAL WORK AT KANSAS CITY, MO.

The Lathrop Trade School has undertaken the construction of a music hall for the Manual Training High School. The building which will be thoroly modern in every respect, will be built entirely by trade school students, assisted by industrial students of the High School. The Lincoln Trade School has completed the Dunbar School, an eight-room building, with a valuation of $25,000.

The Jane Hayes Gates Trade School for Girls has made substantial growth and reports a waiting list for training in vocational home economics. Two additional teachers have been employed.

During the past summer a six weeks' course was conducted in the teacher-training department. In connection with the course, a study was made of trade and part-time school problems and a survey was made of the industrial conditions of the city. The material gathered in the survey will form the basis of programs in trades and vocational work to be offered this year.

Special mention is made of the fact that the city as a whole has shown a fine interest in part-time education. The chamber of commerce and various business men's organizations have given the work their support and every business man has agreed to send employes to the school and to pay them for the time spent. The local trade union, as well as employers' organizations, have cooperated in the teaching of the different lines of trade work and many of the unions have enrolled apprentices for all-day trade training and for evening courses at the Lathrop Trade School.

NEWS AND NOTES.

Vocational Work for Shut-Ins. The Vocational Society for Shut-Ins, at Chicago, is doing some excellent work along vocational lines for the "shut-ins" of the metropolis. The society finds work for each particular case along the line of lamp-shade making, rug making, brush making. The work enables the sufferers to earn a little money and it results, in many cases, in marked improvement in health.

A Trade Technical School. Plans have been begun by Dr. C. A. Prosser for a trade technical school and research laboratory to be established at Minneapolis. The school has for its aim the training of men to scientifically conduct the business of members of the trade associations. The laboratories seek to provide research work with a view of finding practical applications for new discoveries of value to the trades. Leading experts in the movement will be placed on the faculty and research workers will perform the laboratory work.

Industrial Education Continued. Work in industrial training at the University of Texas is being continued with increased facilities and additional courses. The purpose of the work is to educate and train workers, for the trade, and to assist those in service to secure advanced training.

Vocational Training for Disabled in Industry. The Vocational Bureau of the Ohio Department of Education has made arrangements for the vocational training of men and women who have been injured in industrial occupations. The state proposes to expend $34,000 for this work during the present year.

Home Making Courses for Advanced Students. An intensive course in home making for high school and college graduates has been inaugurated at the Newton Vocational School, Newtonville, Mass. Courses in dressmaking and cooking have also been added for women over 18 years of age.

New Department Added at High School. A portion of the basement at the high school, Belleville, Ill., has been remodeled for work in blacksmithing and manual training.

Vocational Courses at Antigo. The Antigo, Wis., vocational school opened with instruction in fifteen different subjects. Architectural drawing, shop mathematics, sewing, cooking and automobile mechanics are offered.

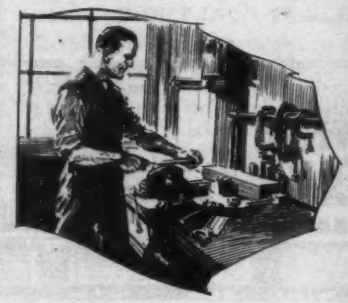
Trade School at Mobile. A trade school has been opened in a remodeled building at Mobile, Ala., under the direction of the Federal Board of Vocational Education. The trade work will be supervised by Mr. E. L. Grover.

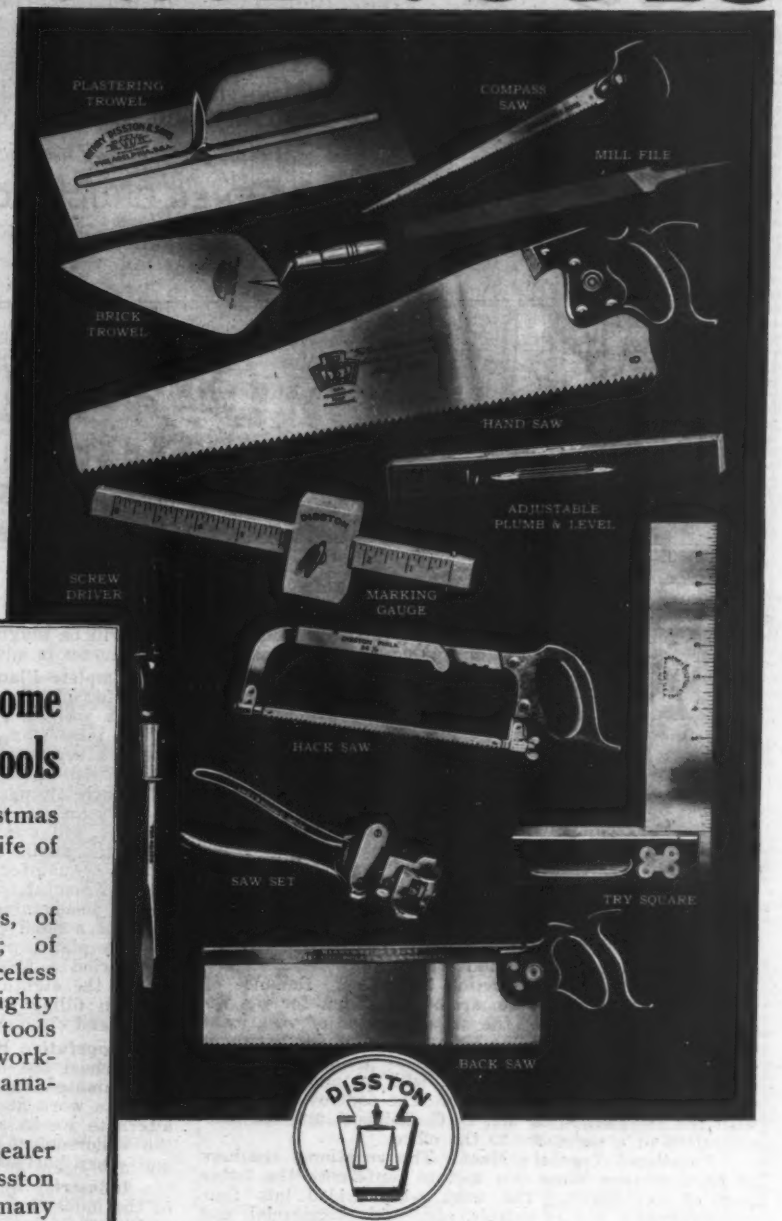
Vocational Work on Production Basis. The Vocational School at Fond du Lac, Wis., has placed the machine shopwork on a production basis this year.

Enlarge Courses in Vocational Classes. The courses in vocational subjects offered at the Baltimore, Md., school have been enlarged with the addition of home-making subjects for women and shipyard training for men.

(*Continued on Page* XXIV)

DISSTON
SAWS AND TOOLS





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Disston Saws and Tools, of fine, Disston-made steel; of workmanship that is a priceless heritage from more than eighty years' experience; honest tools worthy of the most skilled workman and the best friends an amateur craftsman could have.

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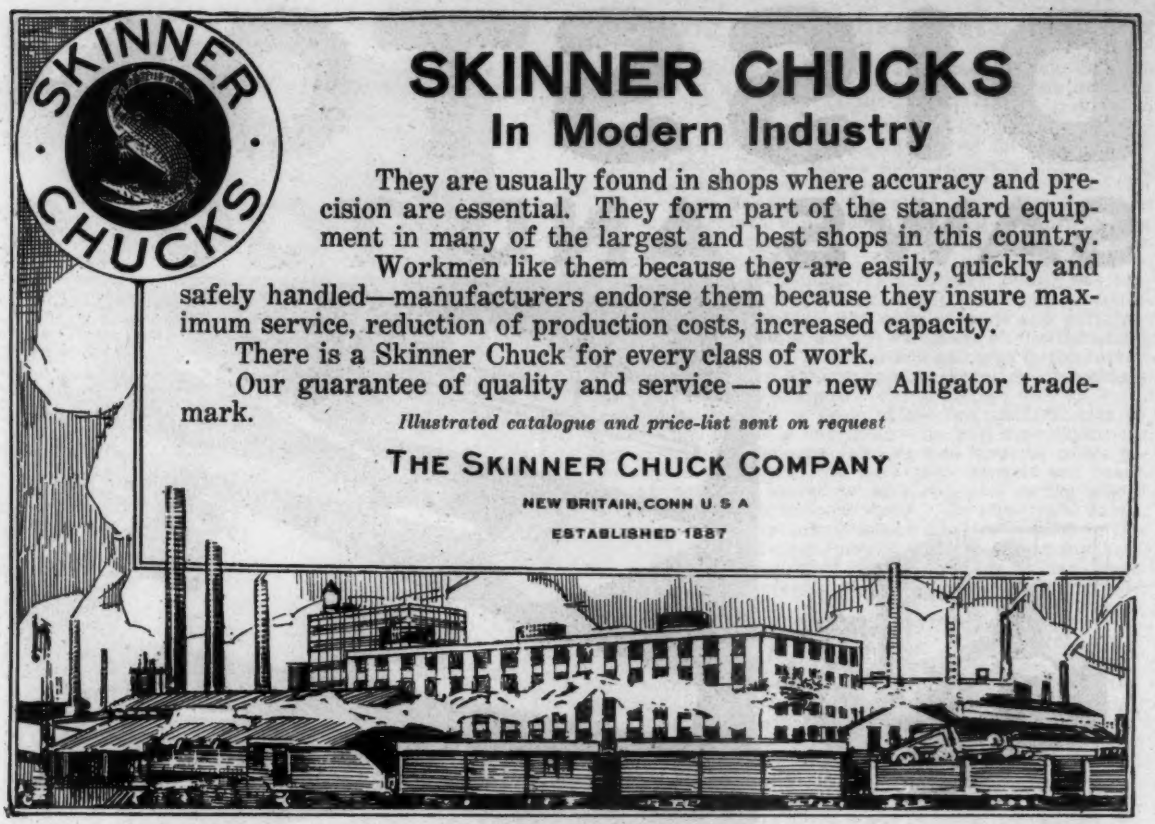
Henry Disston & Sons, Inc.
Philadelphia, U. S. A.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(Continued from Page XXII)

Courses for women embrace sewing and dressmaking, millinery, household arts, laundry work, budget making and household physics. Courses for men cover blue print reading for shipbuilding, elementary ship-fitting, automobile mechanics, industrial chemistry, pattern making, carpentry, machine shop practice, printing, telephone installation, sheet metal work, power plant, steam engineering, radio operating.

Propose Central Vocational School. Supt. B. B. Jackson, Minneapolis, in his five-year program, has made plans for the remodeling of the present high school at East High into a central institution for boys' and girls' vocational work. The plans provide for the transfer of all East High students to the new junior and senior high schools, and the housing of the present girls' vocational classes in the East High. It is also planned to house in the latter institution, all boys and girls who are turned back into the schools from business and industry.

Oppose Proposed Reduction in Salary. Defiance of the wishes of Governor Goodrich of Indiana for the reduction of the salary of the state director of vocational education from $6,000, has been expressed by members of the state board of education. It is predicted that the governor, in his official capacity, will not approve a salary of more than $5,000 a year. The controversy began with the resignation of Mr. C. G. Collicott and the consideration of a successor to the office.

Vocational Teachers Meet. The vocational teachers of northwestern Wisconsin met in conference the latter part of September. The work was divided into four groups, trades and industries, academic, commercial, and home demonstration.

Part-time School Opened. A part-time school for employed minors has been opened at Utica, N. Y., under the direction of Mr. H. B. Griffith. One-half the time in school will be given to trade or industrial work and the other half to bookwork closely related to the work in which the students are engaged.

Fall River, R. I., Has Continuation School. A continuation school for working boys and girls has been opened. For the boys, instruction will be given in woodworking, printing, automobile repair, and electrical work. Girls will be taught nursing, home management and kindred courses in addition to academic studies.

Complete Plans for Trade School. Dallas, Tex., has completed plans for the opening of a free trade school. Courses will be given in trowel work, including bricklaying, plastering, cement and mortar laying. The work has been begun under the auspices of the Southern Shop Association.

Teach Occupational Opportunities. A new system of education has been begun at Cleveland, O., where the teachers will stress the training in the vocational lines which the pupils have selected as their lifework. Pupils will be acquainted with occupational opportunities, physical and mental capabilities, advantages of advanced education, disadvantages of low grade business schools, the value of a fixed purpose and apprenticeship training.

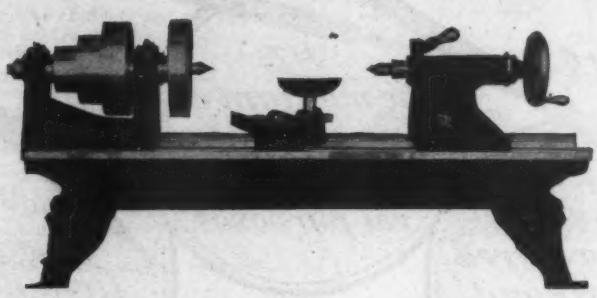
The plan provides for a definite course of 34 lessons, one period a week, to be given in the English classes during the eighth year; individual consultation with the child in filling out the vocational card, and entertainments and circular literature for the parents.

Cooperative High School Established. A cooperative high school has been opened at Gloucester, Mass., with an estimated enrollment of one thousand pupils. The students work at their usual vocations one week, and on alternate weeks attend the high school. The work has the endorsement of the department stores' association and other business organizations.

Industrial Survey Begun. A comprehensive survey of the industries of the city and vicinity has been begun at Philadelphia, Pa., in conjunction with the survey of the vocational department of the schools. The survey, it is pointed out, has become necessary by the fact that the activities and needs of the city have advanced beyond the equipment furnished the pupils by the public school system. The two surveys make it possible to study the needs of the community both from the standpoint of the industry and of the student who must later depend upon the industry for a livelihood.

(Continued on Page XXVII)

Build an 8 inch Bench Lathe in your School Machine Shop



Text Book for the School Machine Shop, "How to Build an 8 Inch Bench Lathe".

THE ABOVE ILLUSTRATION SHOWS AN EIGHT-INCH BENCH LATHE.

Lathe takes 14 inches between centers, the spindles are equipped with No. 1 Morse Taper, head spindle has a ⅝-inch hole its entire length, bearings are of phosphor bronze and are adjustable, belt on spindle cone 1¼-in., weight of lathe finished without countershaft, 80 pounds; weight of countershaft finished, 60 pounds.

"HOW TO MAKE AN EIGHT-INCH LATHE."

"How to Make an 8-inch Lathe," is a text book for students in the school machine shop. It contains detailed drawings of each part of the lathe, countershaft, centers and hand rest. The book also contains detailed instructions as to how to proceed with the machine work on the parts shown on each drawing. This booklet free to educators.

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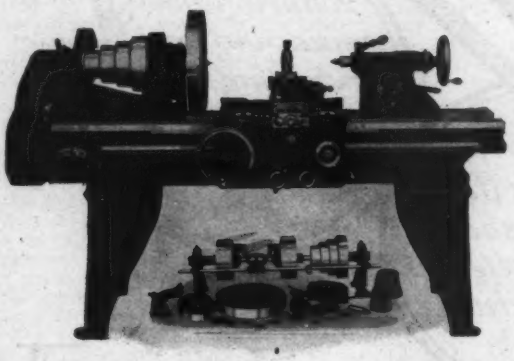

15" Semi-Quick Change Gear South Bend Lathe

Price $550.00

Price includes equipment as shown in illustration.

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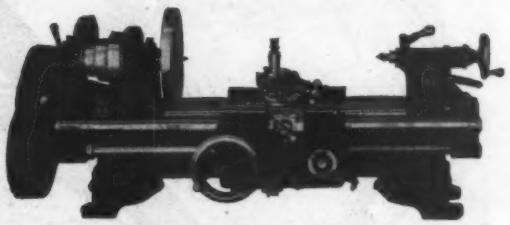

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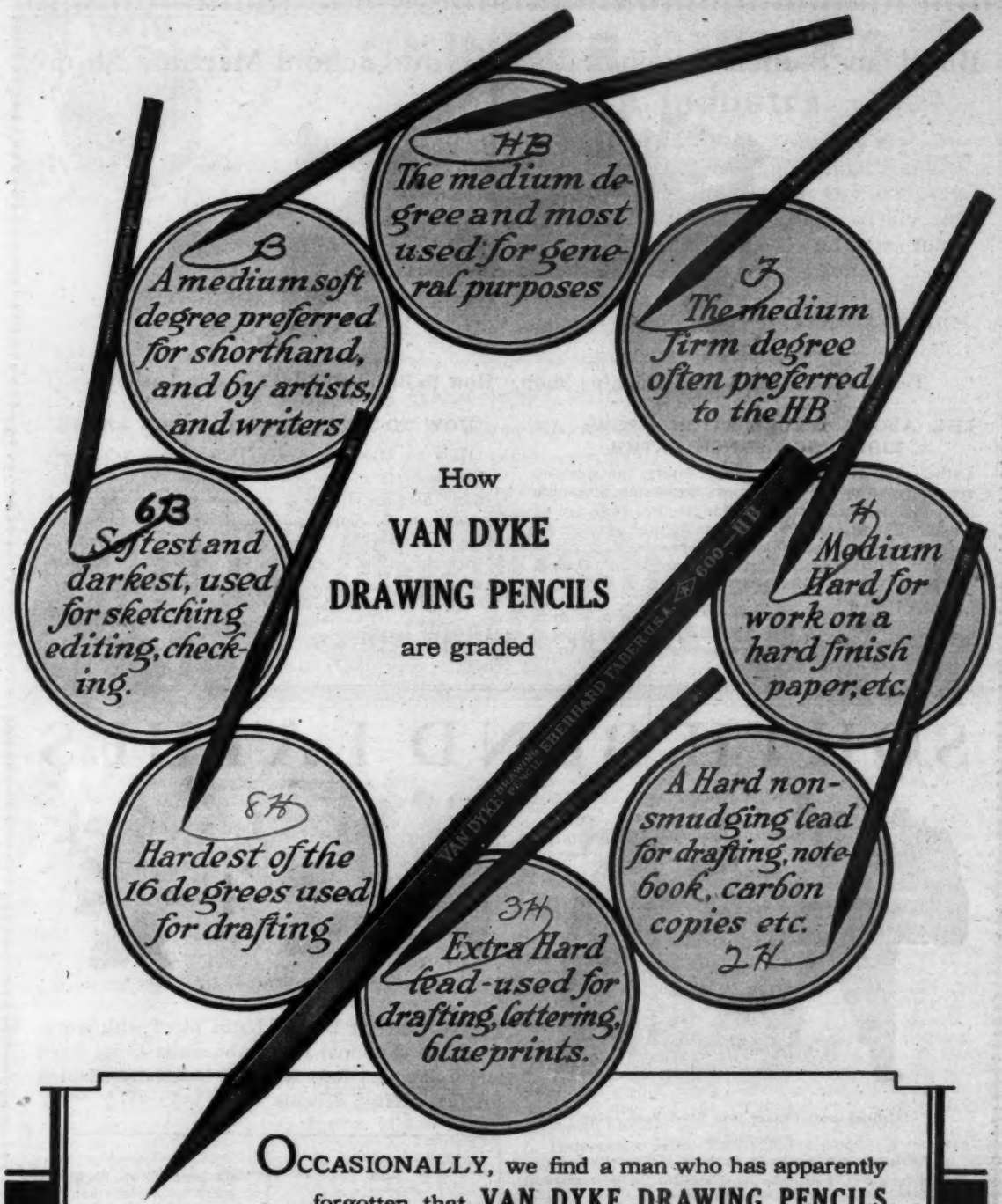
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NEW YORK

(*Continued from Page* XXIV)

Course in Automobile Care and Maintenance. Instruction in the proper care and the mechanism of an automobile is being offered at the Crockett evening high school, Memphis, Tenn.

Training Teachers for the Industries. Vocational training classes for teachers of trade subjects have been opened at the high school, Williamsport, Pa.

Improvements at Springfield, Ill. The board has installed equipment for automobile mechanics and machine shop practice in the high school. It is planned to enlarge the metal working department to take care of an increased enrollment which has grown fifty per cent in the last two years.

Shopwork Offered in Junior High Schools. The board of education at Oakland, Calif., has established seven Junior High Schools, in each of which special types of shopwork are offered. Eight instructors have been engaged for high school shopwork and seven for elementary work.

Vocational Program for Continuation School. Hoboken, N. J., has taken steps to formulate a program for the vocational side of continuation school work. Manual training classes in the grades offer cooking and sewing for the girls, and for the boys, shopwork in which tin can work plays a part. The high school offers machine shop practice and cabinet work for boys, which is supplemented by a course in mechanical drawing. The girl students devote their time to dressmaking and designing, and the management of a kitchen. The Junior High School offers woodwork and elementary electricity for the boys, and sewing for the girls.

Changes at Reading, Pa. Electricity, machine shop practice, mechanical drawing and printing are offered in the continuation school. In the practical arts department, high school boys of the second-year classes are given one year of pattern making instead of a half year as formerly. All 5-A boys in the grades have been admitted to the woodworking classes, and eighth-grade pupils spend one year in sheet metal work.

New Equipment Installed at Wichita, Kans. A cylinder printing press has been installed in the high school print shop, with an expert pressman in charge. The printing equipment is valued at $10,000. The work in automobile mechanics has been divided into repairing and rebuilding. Beginners are started on rebuilding work and advanced students undertake the repair of cars.

Continuation Schools at Worcester, Mass. The continuation schools opened with an enrollment of 1,700 students. The classes are conducted under the direction of Mr. James F. Leary, who has opened his headquarters in one of the school buildings.

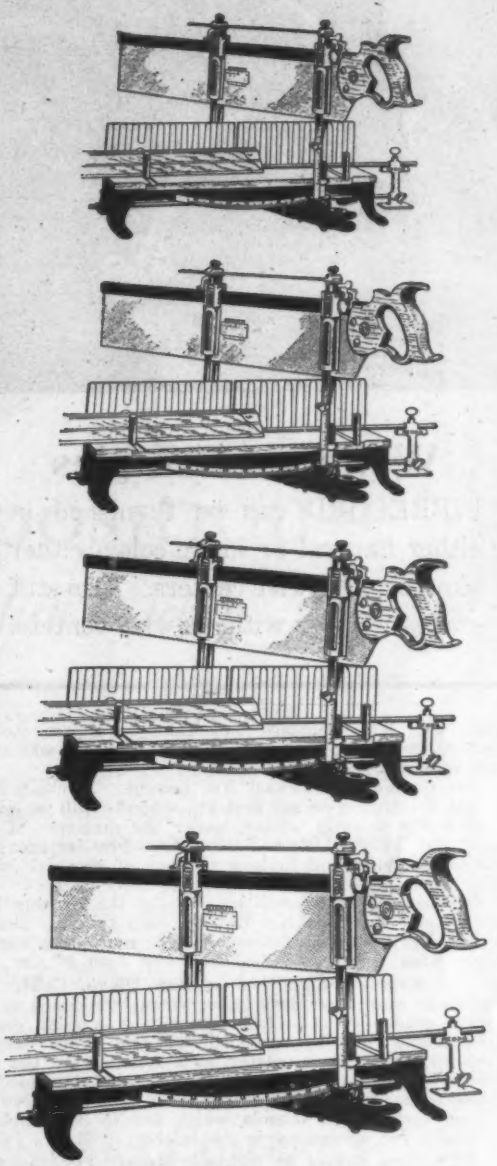
Industrial Instability of Child Workers. The Children's Bureau of the United States Department of Labor, in a recent report, points out that one child in every four in Connecticut, within a year after they were legally permitted to work, left school for that purpose. This does not include the newsboys and those engaged in agriculture and domestic service. Three-fourths of the children went to factories, the largest number of boys going to the metal industries and the girls to the textile and clothing factories.

The report which includes more than two thousand boys and girls, and covers 21 to 24 months' work, also brings out the fact that girls showed a greater tendency to remain in the first positions they took, one-third remaining 21 months or longer in their first position. Of the boys, eighteen per cent left the first job within a month and more than one-half shifted work before six months. The greatest amount of changing occurs in the clothing industry and the least in the textile industry. The restlessness in employment is attributed to the difference in boys' work and to the greater variety of work open to them.

A great deal of the work in which children engage is temporary or seasonal and ten per cent of the boys and eight per cent of the girls lose at least one week of work in the first month of their employment. The proportion of unemployment becomes less as the children become used to industry.

New Courses at Rockford, Ill. A two-year, full-time, Smith-Hughes course in machine shop practice is offered in addition to prevocational finding courses in machine shop practice, forging, foundry work, pattern making, electricity, sheet metal work, printing and carpentry for eighth-grade classes. In a new platoon school shop, a community repair shop is conducted as a part of shop

Stanley Tools



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experience. The students undertake to repair stoves, furniture, plumbing fixtures, cooking utensils, and electrical apparatus.

Art Calendar of School Art League. A number of illustrated lectures on art and art subjects will be given in the fall and early winter, under the direction of the School Art League, New York City. The lectures are open to members and juniors and are of especial interest to pupils in the graded schools of New York.

The lectures which will be given at the Metropolitan Museum and the Brooklyn Museum, will take up picture making, Egyptian art, fashion design, sculpture, Michelangelo, King Arthur, Sir Galahad, and Joan of Arc.

New Courses Introduced at San Diego, Calif. An elementary course in concrete has been introduced in the seventh grades for the fall session. A similar course in electricity will be provided for the upper seventh classes in the spring semester, as a step toward the preparatory work to be offered in the new intermediate schools to be established. Plans have been prepared for the two junior high schools which are to be completed and ready for occupancy in September, 1921.

Part-Time School at Billings, Mont. The part-time school will resume its work in its new home at the Jefferson School. All employed boys and girls between the ages of 14 and 18 are eligible for classes.

Improvements at Baltimore, Md. A $25,000 addition has been erected for the vocational school, doubling the accommodations at the school and providing space for a department of machine shop practice, electrical work, automobile construction and mechanical drawing.

A number of new industrial courses have been added in the evening vocational schools, embracing shipyard work and related subjects, general courses in drawing, design and blue print reading, elementary electricity, wiring and storage batteries, automobile mechanics, industrial chemistry, sewing and dressmaking, millinery and household arts. Additional industrial courses are offered in the subjects of experimental electricity, pattern making, carpentry, machine shop practice, printing, telephone installation and maintenance, sheet metal work and power plant steam engineering.

Vocational education in Iowa has been advanced another step in the enlargement of the teacher training program for trades and industries. Last year Iowa State College at Ames was designated by the State Board for Vocational Education as the teacher training institution for trade and industrial teachers, and a beginning was made under Prof. K. G. Smith. This year a full program of extension classes and correspondence work was carried on during the school year, and special classes were established on the campus during the summer quarter.

PERSONAL NEWS.

Prof. Benjamin T. Leland, formerly of West Virginia University, has been elected Supervisor of Industrial Education for Rhode Island. Mr. Leland makes his headquarters at the State House, Providence.

Frank K. Lane, formerly in charge of the woodwork and weaving curative shops at the Walter Reed Hospital, has become occupation therapist for the Philadelphia Hospital for Mental Diseases, Byberry Division. In his new position, he has charge of the curative shop work for men patients at the hospital.

E. E. Parlin, formerly Supervisor of Mechanic Arts at Norwood, Mass., has become Director of Vocational Work in the high school at Lawrence, Mass.

Mr. Charles A. Wardner, formerly director of industrial education at Olean, N. Y., has become Director of Educational Guidance at Jackson, Mich. In his new position, Mr. Wardner will have charge of four principal branches of work, namely, general supervision of industrial work of the city schools, direction of part-time classes, supervision of vocational guidance and placement of young people, and the making and keeping of an industrial survey of Jackson.

Mr. A. H. Edgerton, formerly head of the industrial arts department at the Lincoln School of Teachers College, has recently become assistant professor of vocational education at Indiana University, Bloomington. In his new position, Mr. Edgerton will devote his entire time to the training of vocational teachers for Smith-Hughes work, and to foreman training for the industries.

(*Concluded on Page* XXXI)

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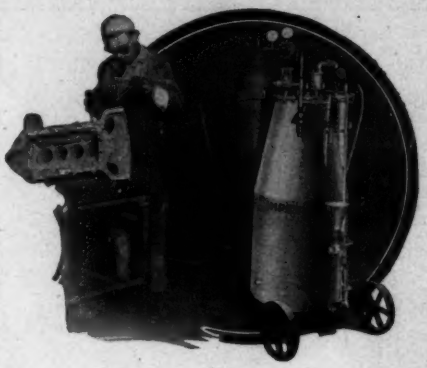

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By R. A. Loomis

The Taylor Holden Co.

Springfield Massachusetts

(Concluded from Page XXVIII)

Miss Wilma Dietmeier, of the household arts department of the Cincinnati public schools, has become instructor in household arts at the Cincinnati University.

Mr Frederick Huling has been appointed as instructor in mechanical drawing in the Providence Technical High School, Providence, R. I.

Mr. A. A. Miller has been appointed to succeed F. J. Sessions as principal of the part-time school at Davenport, Ia.

Mr. L. B. Echols has been appointed instructor in manual training at the high school, Quincy, Ill.

Miss Mariette Smith has been appointed superintendent of the Girls' Vocational School at Tullahoma, Tenn.

Mr. Percy F. Brigham has been appointed as an instructor in the Vocational School at Somerville, Mass. Mr. Brigham was formerly instructor in mechanical drawing at Malden.

Mr. Arthur H. Atkins has been appointed instructor in shopwork and drawing at the South High School, Worcester, Mass.

Mr. H. Louis Thompson has been appointed instructor in mechanical drawing at the North High School, Worcester, Mass.

Mr. J. E. Lockwood, of Ottawa, Kans., has been engaged as teacher of drawing in the Senior High School, Wichita.

Mr. J. F. Parks, formerly supervisor of manual arts at Wichita, Kans., has resigned. Mr. Parks is succeeded by Mr. O. B. Badger, formerly at the Kansas Manual Training Normal School.

Mr. J. R. Prosser has been appointed as assistant director of Boys' Vocational Work at Oakland, Calif. Miss Jessie Calder is Supervisor of Industrial Arts Work.

The New Britain Trade School at New Britain, Conn., reports the following new men on the faculty:

G. E. Forbush, Peter Bauer, William Wald, in the drafting department; Edwin Sibley, in the electrical department, and Walter Murphy, in the general education department.

Mr. Frank Cushman, who for the past two years has been regional director for the Federal Board of Vocational Education, has become principal of the Lathrop Trade School, Kansas City, Mo. As a former employe of the Federal Board, Mr. Cushman brings to his new work a unique experience gained from studying schools and types of work in nineteen different states. He was formerly head of the high school manual arts department and also of the Polytechnic Institute.

NEWS FOR THE BUYERS OF INDUSTRIAL ARTS EQUIPMENT.

E. C. Atkins & Company, Indianapolis, Ind., manufacturers of steel saws, saw tools and machine knives, have recently erected three new structures, embracing a handle factory, a four-story addition to the power plant and a three-story building for the saw department.

In the three-story building, the basement is to be devoted to a grind-stone cellar, and the other floors will be given over to the cylinder saws and narrow band saws.

The new buildings have been erected to provide more space for the storage and handling of tools and machines and to permit of expansion in the future. The firm is now in position to take better care of its customers in the way of more adequate equipment and prompt handling of orders.

OCCUPY NEW QUARTERS.

The International Electric Company, Indianapolis, are now in their new location at 217-219 McCrea street.

The steadily increasing demand for International Electric Heaters has meant constant growth to the company. In their new location they will have more than five times their former floor space. New machinery of the latest design has been installed to increase production and at the same time keep up the high quality of International products.

NEW BOOKLET ON FLOOR FINISHES.

S. C. Johnson & Son, Racine, Wis., have issued a booklet entitled "The Proper Treatment for Floors, Woodwork and Furniture", in which is described the entire line of Johnson wood finishing products.

The booklet which has been prepared especially for the use of teachers, architects, contractors, painters, interior decorators and persons building new homes, gives detailed information as to the proper way of finishing new and old

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A NEW CATALOG OF SHEET METAL MACHINES AND TOOLS.

Peck, Stow & Wilcox Company of Southington, Conn., have just issued Catalog 20-A, the centennial edition, listing their machines and tools for sheet metal work.

The catalog which contains 399 pages, lists in a convenient and compact manner, all the machines and tools which are manufactured for the use of tinsmiths, sheet metal workers, mechanics and builders. The catalog is a little out of the ordinary, in that it has little points of human interest in the form of line drawings, little bits of advice in graphic form, shop jokes, and illustrations of typical sheet metal processes.

Among the articles described and illustrated are different kinds of shears for special types of work, lining cutters, punches, combined shears and punches, notching machines and presses, slitting and circular shears, folding machines, brakes and benders, pan and box forming machines, pipe forming machines, tube and funnel formers, grooving machines, light bench wiring, turning, burring and setting down machines, machine standards, corrugating machines, double seaming and bottom fastening machines, wire reels and cutters, soldering appliances, and miscellaneous hand tools.

The last section of the booklet is given to a variety of useful tables of gauges, weights and measures, circumferences, decimal equivalents, melting points of different metals and a standard table for steel wire.

MR. BENSON GOES TO AMERICAN CRAYON COMPANY.

The American Crayon Company of Sandusky, Ohio, has an educational department which is almost entirely composed of educational men of wide experience in school work. It was found necessary to employ such men in order to work in perfect harmony with the schools of the country.

One of the men who was employed during the summer months is Mr. A. F. Benson, Principal of the Minneapolis Bremer Junior High School, which position he has held for the past two years. Of recent years he has also been lecturing for prominent Chautauqua circuits. Mr. Benson entered this new work to carry out his ideas on school management, which gave him an opportunity of addressing representative gatherings of teachers in summer sessions of normal and art schools of the New England States on practical educational problems as applied to present everyday needs of commercial and industrial activities. He is a specialist in education and has compiled extensive records on developments in junior high schools in the east as well as the west and is an authority on the junior high school education of children.

NEW TRADE MARK ANNOUNCED.

A new trade mark, very simple but at the same time unique, and one of the most interesting that has been developed by a manufacturer of chucks, has been adopted by the Skinner Chuck Company, Inc., of New Britain, Conn., and will be stamped on all Skinner chucks in the future to indicate that they were made and are guaranteed by the Skinner Chuck Company.

The trade mark shows an alligator in the form of the letter "S", superimposed on a solid black circular background, encircled by the words "Skinner Chucks". The alligator was chosen as the symbolic figure best suited to the exploitation of Skinner Chucks, because both the alligator and Skinner Chucks are famous for their wonderfully strong jaws and long life.

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for Mechanical and Domestic Art Instructors

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Essentials of Mechanical Drafting

Elements — Principles — Methods
By LUDWIG FRANK

This standard work is a condensed encyclopedia of the subject. The text is clear and concise. The 224 drawings copiously illustrate the reading matter. It is a *vade mecum* for the instructor of Mechanical Drawing.
This book is not only of great value as a text book in High Schools, but is recommended as a reference book for all mechanical draftsmen. It is substantially bound in dark green cloth, size 7¼ x 10½.
The book will be sent to any instructor of drawing upon approval.

Art in Costume Design

For those interested in Art, Sewing, History, and Literature
By EDNA MANN SHOVER

Every instructor of advanced work in fabric and costume design should have this unique source of suggestion and inspiration at hand. The logical development of motifs is admirably worked out, with elemental designs taken from various periods and nations, from nature, architecture, etc. These elements are conventionalized, fabricated, and shown suitably employed in completed costumes.

Constructive Figure Drawing

8 Plates for Poster and Costume Designing
By WARREN A. NEWCOMBE

An instruction book, and eight charts 9 x 12 inches in size, form this remarkably practical and effective method of teaching Figure Drawing. Geometric forms are used as a ground work for developing each separate feature. Even those with no natural aptitude for art, cannot help but do creditable work when instructed along these lines.

The avowed purpose of this series is to enable the student to secure creditable results in poster designing. For this reason a complete alphabet of appropriate lettering, with figures, is appended.

Mechanical Drawing and Practical Drafting

By CHARLES H. SAMPSON
Head of Technical Dept., Huntington School, Boston, Mass.

In this truly remarkable compendium, with its 76 full page plates, the author has logically and systematically developed a complete school course in Mechanical Drawing. It is safe to say that any student who progresses step by step through this carefully planned course, will emerge a practical working draftsman. No better plan could be followed for imparting the essentials of the craft.

Prof. Sampson's enviable reputation as an instructor and authority on this subject, is amply borne out by this book into which he has put his best work.

We would like to have every teacher of Mechanical Drawing examine this publication and express an opinion on its merits. Sent on 10 days' approval.

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We invite you, as a representative Art Instructor, to make a FREE examination of the four Bradley Quality Publications mentioned on this page. That is the only way in which we can adequately demonstrate the importance of these School Art books and charts. You will find them a "gold mine" of working plans and suggestions. Just mail a post card saying "Send on ten days' approval" the titles in which you are interested.

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VOCATIONAL ARITHMETIC FOR GIRLS

By Nettie Stewart Davis

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Part Two

Decimal Fractions—Trade Problems such as: Pleating—Cost of material one end of which is cut on the bias, the other on the straight — Bills — Domestic Science Problems.

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Percentage—Domestic Science Problems —Bias and Straight Bands, length, compared — Pleating Problems — Ratio and Proportion — Carpeting Problems — Review Problems.

Part Four

Home Maker's Problems—Furnishings for a Small Modern Home—Upholstering Problem—Interior Decoration—Papering —Painting—Varnishing—Cost of Painting the Outside of a House—Floor Covering — Linoleum — Hardwood Floors — Sodding Problems—Cement Work—Cement Sidewalk — Cement Basement — Roofing Problem—Clothing for 16 year old girl for one year—Family Accounts—Buying a Home on Payment Plan—Postal Information—Banking Notes—Receipts.

The trade problems given in this book are practical everyday problems, the kind girls are called upon to solve in their daily work.

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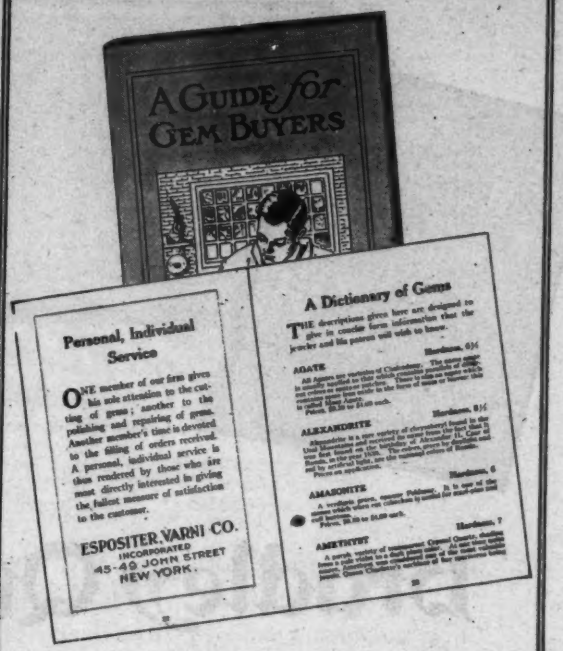

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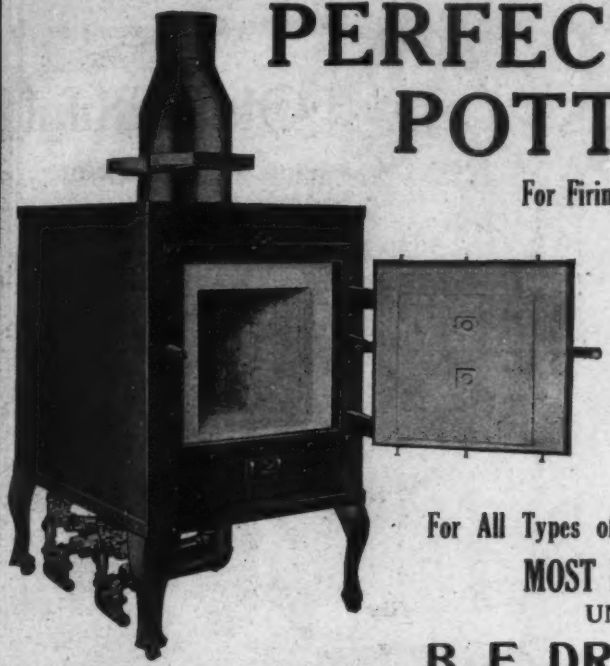

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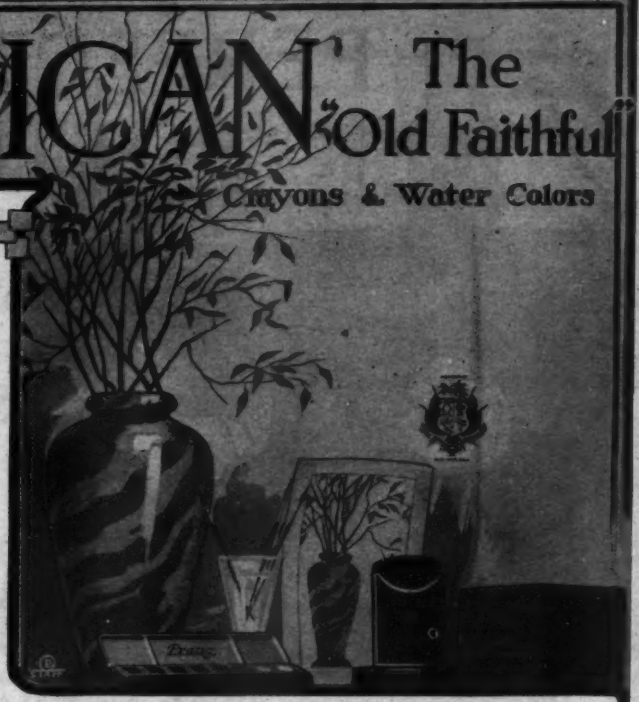

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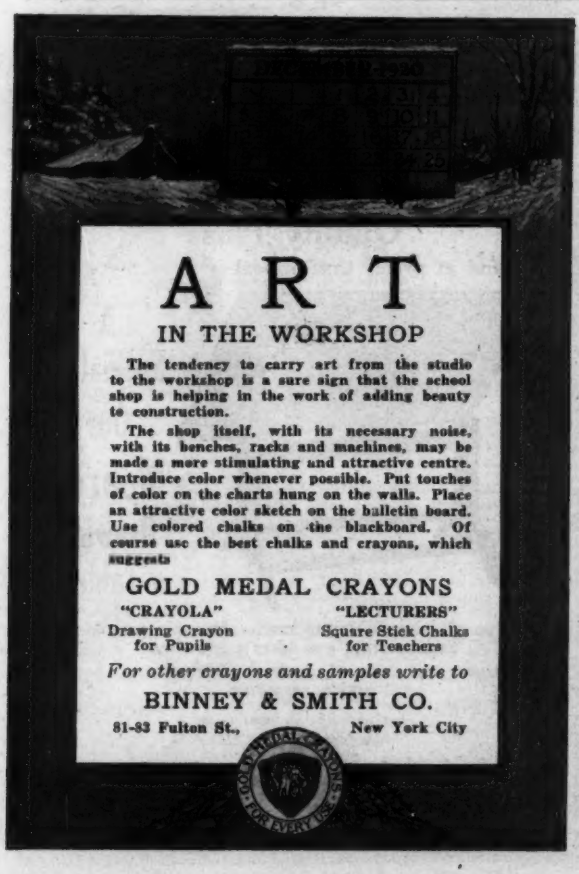

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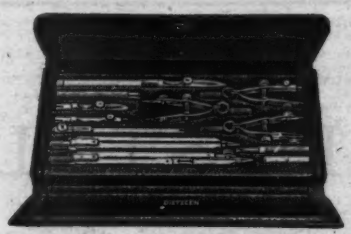

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